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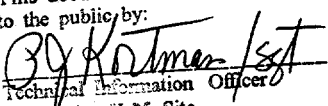
**SANTITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION
PLANT QUARTERLY REPORT THIRD FISCAL QUARTER (JANUARY 1 THRU
MARCH 31, 1969)**

(EXTRACTED FROM CRD DOCUMENT # K-1807)

**Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement**

December 21, 1995

**Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400**

This document has been approved for release
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Technical Information Officer
Oak Ridge K-25 Site
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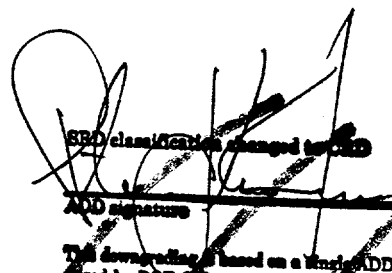
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OAK RIDGE GASEOUS DIFFUSION PLANT
QUARTERLY REPORT (U)
THIRD QUARTER FISCAL YEAR 1969
January 1, 1969 thru March 31, 1969


SRD classification changed to (U)
ADD signature _____ Date 11 OCT 95
This downgrading is based on a final ADD review authorized by DOE Office of Declassification Management 10/94

OAK RIDGE GASEOUS DIFFUSION PLANT
Oak Ridge, Tennessee

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GROUP 1
Excluded from automatic downgrading and declassification.

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TABLE C-8
URANIUM-235 INPUT
(Kilograms U-235)

1968	Total	Daily Rate	% Change	1969	Total	Daily Rate	% Change
October	1,959.2	63.2	49.8	January	2,326.9	75.1	3.6
November	2,053.9	68.5	8.4	Feb.	2,068.6	73.9	-1.6
December	2,246.3	72.5	5.8	March	2,409.6	77.7	5.1
Total	6,259.4			Total	6,805.1		
Average		68.0	89.4	Average		75.6	11.2

TABLE C-9
CASCADE INVENTORY CHANGE
(Kilograms)

Second Quarter, FY 1969				
Month	Uranium-235		Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
October	911.4	79.4	368.8	76.9
November	786.2	-125.2	271.0	-97.8
December	760.1	-26.1	256.2	-14.8
Total		-71.9		-35.7
Third Quarter, FY 1969				
Month	Uranium-235		Xe	
	Ending Inventory	Δ	Ending Inventory	Δ
January	856.1	12.6	325.1	26.9
February	815.1	-4.8	294.3	-9.5
March	793.6	-1.4	273.8	-7.0
Total		6.4		10.4

EFFICIENCIES AND PURGE RATES

OPERATING EFFICIENCIES

Based upon the separative work concept, the cascade efficiencies for January, February, and March were 99.94, 99.96, and 99.92%, respectively, giving a quarterly average efficiency of 99.94%.

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On Stream Efficiency

The Cascade onstream efficiency during the third quarter of fiscal year 1969 averaged 99.87%. Excluding off stream time attributable to the Plant Test Program and power control, the efficiency averaged 99.88%.

The quarterly efficiency for each of the cascade buildings averaged 99.86% for K-33, 99.81% for K-31, and 99.99% for K-29.

The major causes of offstream time are tabulated in Table C-10. The data are presented by months for the current quarter; totals are given for the current and previous quarter for comparison.

TABLE C-10

HOURS OFF STREAM

	<u>January</u>	<u>February</u>	<u>March</u>	<u>FY 1969</u>	
				<u>3rd Qtr.</u>	<u>2nd Qtr.</u>
Compressor Seal	5.29	27.36	30.41	63.04	105.08
Stage Motor	0	0	0	0	9.67
Stage Compressor	26.28	6.58	0	32.86	58.33
Instrumentation	4.92	3.25	0	8.17	0
Coolant System	1.25	3.01	0	4.26	8.58
Inleakage Checks	1.50	0.50	0.68	2.68	5.86
Treatment Operation	6.83	6.08	0	12.91	62.82
Power Control	0	0	4.07	4.07	0.53
Power Interruptions	0	0	0	0	66.10
Plant Test	22.76	0	0	22.76	148.90
Miscellaneous	35.08	23.17	46.19	104.44	107.40
Econ. Scheduling	0	26.12	5.50	31.62	508.67
Total	103.89	96.07	86.85	286.81	1,081.94

PURGE CASCADE

The average normal purge rate at K-311-1 during the third quarter was 8,726 scf per day. The highest monthly average during the quarter was in February when 9,758 scf per day was purged. The January and March rates were 8,000 and 8,419 scf per day, respectively.

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TABLE C-18
AUXILIARY PRODUCTION AND USAGE

	January	February	March	3rd Quarter FY 1969	2nd Quarter FY 1969	% Change
Nitrogen Production, Ft ³ Used at ORGDP To ORNL and Y-12	6,097,000 3,273,017 2,796,507	4,880,000 3,271,694 1,680,865	6,864,000 3,018,693 3,922,836	17,841,000 9,563,404 8,400,208	17,197,000 11,657,151 5,380,396	3.7 -18.0 56.1
Hydrofluoric Acid Usage, Lbs.: Fluorine Production	1,500	3,395	1,080	5,975	6,669	-10.4
K-1420 Production: Starting Material, Lbs. Oxide from Calciners, Lbs. U Bleaching Runs Polishing Runs Electroless Ni Plating, Mil Ft ² Electroplating Other, Mil Ft ² Metal Anodized, Ft ² Metal Alodined, Ft ² Black Oxide, Ft ² Metal Preparation	5,600 341 1 - 1,530 3,169 112 118 76 745	14,000 61 - - 1,217 2,778 31 104 33 387	24,916 285 1 - 701 3,681 82 51 34 450	44,516 687 2 0 3,448 9,628 225 273 143 1,582	33,708 752 2 7 3,426 - 784 251 130 0	32.1 -8.6 0 - 0.6 - -71.3 8.8 10.0 -
K-1420 Recovery Operations: Uranium Solutions, Liters: Y-12 ORGDP Mercury, Lbs.	912 252 615	1,301 932 634	1,709 1,064 -	3,922 2,248 1,249	6,046 2,630 1,520	-35.1 -14.5 -17.8
Decontamination and Services: Converters Compressors Cylinders Field Decontamination Jobs Alumina Traps Dumped Small Parts	4 13 47 - 33 3,708	- 9 182 - 24 1,596	- 1 108 - 31 2,394	4 23 337 0 88 7,698	2 39 364 85 50 6,690	100.0 -41.0 -7.4 76.0 15.0

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A condensation occurred near the end of March and continued through the first ten days of April. Subsequent recovery of the loss was apparent from the observation of daily feed and production streams.

TABLE C-18

CASCADE MATERIAL BALANCE SUMMARY
(Kilograms)

Third Quarter FY-69	Uranium		Uranium-235	
	Gain	Loss	Gain	Loss
January	-	908	8.4	-
February	-	848	-	19.5
March	-	5,876	-	31.6

Cumulative Plant Account Efficiency

Estimated quantities of material representing the hidden inventory are shown by categories in Table C-19. The plant efficiency was 99.88% for uranium and 99.79% for uranium-235. Cumulative plant uranium and uranium-235 material balance data are shown in Figure C-2.

TABLE C-19

ACCOUNTING MEMORANDUM

Location of Deposit or Source of Material Unaccounted for	Kilograms	
	Uranium	Uranium-235
Cascade:		
Inactive Consumption	12,070.1	1,322.9
Active Chemisorption	665.7	54.7
Physical Absorption	632.1	8.1
Inactive Converters	97.6	2.9
K-1405 Holding Pond*	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP - Paducah Interplant Cylinder (Heels) Dilution before July 1955	-	179.2
Total	27,508.3	1,676.7

* Includes 152.4 kilograms uranium and 2.5 kilograms uranium-235 removed in residue on 10-26-61.

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INDUSTRIAL RELATIONS

SAFETY AND HEALTH

SAFETY

Injury Experience

One disabling injury was experienced during the quarter. The injury-free period began on January 10, 1969, and totals 1,121,118 employee-hours through March. Eight serious injuries were recorded, with a resulting frequency rate of 6.42 as compared to the last quarter experience with seventeen serious injuries and a frequency rate of 14.18.

Property Damage Accidents

Seven incidents resulting in property damage were experienced during the quarter, with an associated loss of \$706, as compared with six incidents and \$3,748 loss during the previous quarter.

Material Releases

No material releases were reported during the quarter.

Safety Improvements

Significant safety improvements were:

1. Installation of two roof ventilating fans above the spray booth in K-1420 to reduce the amount of acid fumes in the operating area when the spray booth doors are opened.
2. Installation of an access stairway and platform for servicing overhead equipment in K-1231.
3. Installation of four additional safety showers and one eye bath in K-1231.
4. Installation of a relay on each of the two K-31 cranes and one K-33 crane that will de-energize the 480-volt crane circuit upon actuation of the upper limit switch, thus providing more positive and dependable protection against two-blocking.
5. Removal of obsolescent open electrical wiring beneath the floor and in the attic of K-1001 and in the attic of K-1002 as a safety and fire prevention measure.
6. Installation of guards over the foot pedals on five press brakes in the K-1401 Sheet Metal Shop to preclude the possibility of someone inadvertently actuating the foot pedal.

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Electrical Audits

Audits of electrical installations associated with new facilities and major alterations of existing facilities indicated general compliance with specifications and code requirements. Ninety-seven percent of the 196 items checked were satisfactory.

Mechanical Safety

Routine inspections and tests of 360 pressure relieving devices, 282 pressure vessels, 414 units of hoisting equipment, and 465 compressed gas or UF_6 cylinders showed no unusual conditions.

Two "H" beam fixtures for handling K-33 converters and three dual purpose fixtures for handling 2-1/2-ton and 14-ton UF_6 containers are being modified to eliminate attachment deficiencies previously associated with these fixtures. Other safety improvements included reidentification of the load ratings on overhead cranes in K-1401, and installation of a radiation warning system in the K-1401 X-ray Facility plus the requirement to wear radiation monitors when in the x-ray enclosure.

Mechanical Safety Standards contained in the Engineering Standards Manual were updated and reissued, and a new standard specifying the safe loads for eyebolts and shackles was originated. The K-25 Mechanical Safety Program was discussed at six safety meetings held by various plant divisions and departments.

Nuclear Safety

Reactivity of PM Replacement Core

Reactivity changes induced by uniform shrinkage or expansion of the PM reactor core in event of an accidental drop were studied using a neutron transport theory code and a modified 16-group cross section set. As reported previously, code calculations for a small decrease of only -0.075 in. in the fuel rod pitch resulted in decreased reactivity, the k_{∞} being reduced by -0.142. Additional calculations for an identical positive change of pitch increased k_{∞} by only +0.068, well within prescribed safety limits. This information was forwarded to the ORNL Reactor Division on January 8, 1969, for their submission of an AEC-0529 evaluation of a depleted metal uranium shipping cask for the PM replacement core.

Plant Audit Activities

The annual AEC-ORO Health Protection Appraisal of ORGDP was held during the week of January 27, 1969, by Messrs. H. W. Hibbitts, Health Physics; W. A. Johnson, Nuclear Safety; and J. F. Wing, Industrial Hygiene. Plant tours and discussions were arranged to coincide with the primary interests of the auditors. In addition, a special video-tape TV film was shown by Mr. W. C. Hartman, Superintendent of the Shift Operations and Security Division, covering the criticality drill held in K-1420 last summer. The drill featured the new mechanical robot which was used in controlling a

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simulated criticality incident.

Nuclear Information Exchange Meeting

A nuclear criticality safety seminar was held at ORGDP on March 19 and 20, 1969, attended by representatives from Y-12, Paducah, K-25 and Portsmouth (GAT). This was an informal meeting for the exchange of information of mutual interest. Topics discussed included the following: criticality experiments, regulatory changes, plant equipment changes and new plant design problems, calculational efforts, toll enrichment requirements, new facilities for handling and sampling the large number of cylinders needed in this program, and future shipment problems with respect to cylinder geometries and material enrichments.

Specifications for Protective Shipping Packages

The ORGDP proposed specifications for the protective shipping packages for UF_6 cylinders and for the fabrication of UF_6 cylinders were reviewed by the AEC Regulatory Division. They were submitted in October 1968 but only recently returned to the Division of Construction, with comments requiring answers. To expedite the program, Messrs. F. W. Stout of the Engineering Division and A. J. Mallett of the Laboratory Division, who were involved in the design and testing of the protective packages and the cylinder changes, met with representatives of the AEC-DOC, the Regulatory Division, Division of Operational Safety, and AEC-ORO on March 24 and 25 in Washington, D. C. All difficulties were readily resolved, and the DOC agreed to rewrite the specifications to include necessary revisions. The specifications will then be forwarded to the Department of Transportation for publishing in the Federal Register for comment.

Disposable Shield Insert for Shipment of Radioactive Waste

At the request of the AEC, shielding studies with respect to the use of an available ATCOR shipping container for shipment of the control rods from the decommissioned BONUS reactor have been undertaken. On the basis of information on the induced activities in the rods, supplied by the United Nuclear Corporation, preliminary calculations indicated that additional shielding would be required. Machine calculations were then carried out with the ANISN transport code for a number of configurations used as approximations of the loading pattern anticipated in the shipment. The calculations were in good agreement and showed that, with the additional shielding, radiation levels will be less than the allowable limits of 200 mr/hr at the surface of the shield and 10 mr/hr 3 ft from the shield.

Minimum Critical ^{235}U Enrichment of 48-Inch-Diameter UF_6 Cylinder

Additional criticality calculations were made for the 48-in.-diam UF_6 cylinder, using the higher uranium density, 4.9 g U/cc for uranyl fluoride, recommended by the K-25 Approvals Committee at a meeting held on January 23 to review this problem. Water entry into the cylinder is assumed. The resultant minimum critical ^{235}U enrichment of 1.16% for the infinite length cylinder, determined by the ANISN code, is somewhat lower than the

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1.3% enrichment value previously reported for a low density system of 3.2 g U/cc. However, calculations using the KENO Monte-Carlo code confirmed the 1.16% value. A short technical memorandum covering this work is in preparation.

Special Test

At the request of the AEC-ORO, a 2-in.-diam pipe with threaded cap ends, overall length of 7-1/2 in., was tested as a special form material encapsulating agent. After a 10-minute furnace test at 1475°F, followed by water immersion for 24 hours, per regulations, the unit contained over 115 ml of water and therefore failed the test.

Fire Protection

Emergency forces responded to seven alarms for fires and seven service calls involving protection or cleanup of water from serious roof or pipeline leaks. There were two instances of sprinkler piping freezing during prolonged cold weather periods. Monetary loss was negligible.

One wet-pipe sprinkler system and one manual fire-alarm box were placed in service in the K-1009 Laboratory during the quarter.

Emergency Training

First Aid, 113 hours; Fire Fighting, 32 hours; Emergency Training, 49 hours; and Rescue, 15 hours.

An audio-visual recording of the Civil Defense Shelter Management Program at K-25 has been prepared and is to be presented to employees in Safety Meetings. The presentation requires about fifteen minutes.

Two fire fighting drills were conducted.

A fire was simulated on the roof of K-1058 in which ten "B" shift Emergency Squad Members and three Fire Drivers participated. The first fire pumper arrived and used the ready line and water from the pumper tank. The other two Fire Drivers connected the four-inch-diameter, soft-suction hose from the second pumper to a fire water hydrant and laid a 1-1/2-in. hose from the pumper to the fire. As Emergency Squad members arrived, more lines were laid. Four 1-1/2-inch lines were laid from the pumps using four-inch, soft-suction hose on both. Also, the Mono-Versal Nozzle on the #1 pumper was used. The fire was assumed to be extinguished twenty minutes after the first equipment arrived.

Twelve "C" shift Emergency Squad members and four Fire Drivers staged a drill which simulated a fire in the K-1056 Warehouse. The procedure for fighting the fire was similar to the "B" shift drill. It was assumed the fire was extinguished thirty minutes after the alarm was sounded.

Promotion and Education

The injury-free period, extending through calendar year 1968, was terminated early in the quarter with a record total of 5,457,210 employee-hours of disabling injury-free operation attained. In recognition of this outstanding performance, the plant was awarded the National Safety Council's Award of Honor and the Atomic Energy Commission's Award of Merit. Merchandise awards were selected for distribution to eligible employees.

The new Safety Incentive Award Plan, which became effective this quarter, received appropriate publicity with various media used to acquaint employees of its objectives and to enlist their support of this plan.

During the quarter, a plant-wide Major Hazard Survey was launched with a letter from Plant Superintendent R. G. Jordan explaining its purpose and scope. Inspection guides and evaluation reports were also provided which are being effectively used to eliminate or safeguard the potentially more serious hazards which, if unrecognized or uncontrolled, could result in multiple deaths or serious property loss.

Routine safety emphasis was continued through such media as plant bulletins, safety billboards, and the Carbide Courier. The latter medium was used to acquaint employees with the new Incentive Award Plan and to solicit employee participation in the Major Hazard Survey. Two pages of pictures of the merchandise award items from which employee selections were made effectively highlighted this safety program activity.

Both the number of safety meetings and the attendance remained high and relatively unchanged from previous quarters as 245 safety meetings were held during the period with 4,168 employees in attendance.

HEALTH

Medical Activities

The medical case load remained essentially unchanged from past averages, with the smaller number in the miscellaneous category primarily reflecting the return to normal after completion last quarter of the immunization of the plant population against the A-2 Hong Kong type influenza. The detailed breakdown by case type is shown in Table E-1.

Personal Radiation Monitoring

The average film badge exposure of fifteen mRem for the 112 persons monitored quarterly compares favorably with the low values reported for recent years. The maximum exposure to a single individual in the plant population considered to have some potential exposure to penetrating radiation approximated twenty percent of the radiation protection guide of 3,000 mRem/quarter.

Similarly, random sampling of the general plant population not normally considered to be "at risk" was continued on a quarterly schedule. These

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results revealed no personnel exposure to penetrating radiation of as much as ten percent of the quarterly guide values.

Analyses of 263 urine specimens for uranium mass and alpha activity this period revealed two instances of exposure that exceeded the radiation protection guide for a single sample and were recalled for follow-up urinalysis. In both instances, the uranium excretion rate promptly returned to a level below the radiation protection guide.

The chemical operator who had been previously reported as having attained a body burden approximating the annual guide value now averages less than forty percent maximum permissible body burden and his restriction was removed. There were no new internal exposures of significance this period.

TABLE E-1
MEDICAL CASE LOAD

<u>Type of Case</u>	<u>This Quarter</u>	<u>Last Quarter</u>
Industrial Injuries and Illnesses	790	727
Nonindustrial Injuries and Illnesses	2,328	2,254
Pre-employment and Rehire Examinations	143	160
Pre-employment Rejects*	0	0
Terminations	40	31
Periodic Examinations	238	190
Interim Examinations	106	168
Industrial Health Examinations	12	5
Optometric Visits	528	499
Return to Work, Recalls, and Miscellaneous	<u>1,772</u>	<u>2,804</u>
Total Case Load	5,957	6,838
Services to Outside Parties (Included in Case Load)	53	42
Laboratory Procedures	6,758	6,679
Electrocardiograms	340	314
X-rays	883	805

* Included in Pre-employment and Rehire Examinations

Industrial Health Examinations and Clinical Urinalysis

Eleven chest and/or sinus x-rays were made on the ten employees scheduled for industrial health examinations. No findings of clinical significance were revealed. Thirty-four employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations. None of the thirty-nine laboratory tests indicated results above the threshold limit value for the material of concern.

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Plant Toxicants

Of the thirty-five analyses made for airborne contaminants, six exceeded the threshold limit value of the materials concerned. Four samples involved carbon monoxide during a study of the operation of a malfunctioning industrial vehicle, and two were for uranium during a cascade cell cleanup operation while appropriate respiratory protection devices were being worn.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by the 2,424 routine shift-length samples recorded by the continuous monitoring units in locations where air contamination is suspected remained essentially unchanged and low, representing less than ten percent of the radiation concentration guide of 10^{-10} $\mu\text{Ci/cc}$ uranium in air. The 907 shift-length air samples taken at four outdoor locations around the plant perimeter reflected an average gross alpha activity downwind from major stack discharges of approximately 7% of the radiation concentration guide for a 40-hour occupational exposure period.

Radiation Source

There were two new radioactive sources registered during the period (six curies of Cobalt-60 and one hundred curies of Iridium-192), and routine checks of the fifteen radium sources at ORGDP revealed no radon leakage.

Potable Water Supply

The beta activity of radioactive contaminants in the plant potable water supply, which is taken from the Clinch River, reflects the effect of the discharge of mixed fission product waste material from an installation upstream. Analyses of the Clinch River samples at CRM-14.5 (ORGDP Sanitary Water Treatment Plant raw water intake), performed by ORNL for their control purposes, are also being used by the ORGDP. There was no indication that peak activity during the weekly sampling periods exceeded the long-term radiation protection guides values, and the 13-week average in plant potable water supply continues to be less than ten percent of the maximum permissible concentration in water for the mixture of radionuclides involved.

Water Pollutants

The average uranium concentration in the Clinch River, sampled approximately one mile below the plant and reflecting the contribution of all of the Oak Ridge Operations, remained less than 0.1% of the appropriate guide values for discharge of natural uranium materials to uncontrolled surface water bodies.

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SECURITY

General

Subcontractors granted manufacturing facility approval this quarter are as follows:

The Dorset Corp., Thomaston, Conn. - Ferrule manufacture; small contract.

The Risdon Manufacturing Co., Naugatuck, Conn. - Ferrule manufacture;
prime contract.

Vernon Tool Company, Ltd., Alhambra, Calif. - Classified tooling.

Active facilities for the quarter totaled 13: five manufacturing and eight document handling.

Visits

During the quarter 995 unclassified and 867 classified visits were made to ORGDP.

Off-site classified visits made by ORGDP employees totaled 450.

Badges

The take-home and supplemental badging for all employees was completed with the new insert.

Access Authorization Clearances

This quarter, 78 requests for access authorization were submitted to AEC for prospective employees. Twenty-seven additional requests for clearance extensions or transfers for employees transferring to ORGDP from other plant locations were submitted to AEC.

Access authorization clearances requested for subcontractor, vendor and construction personnel are as follows: 80 Q's requested, 22 Q's extended, 5 L's requested and 5 L's extended.

Classified Shipments

A total of 15 classified shipments originated at ORGDP and two terminated at ORGDP.

Security Education

Slides to be used in a security education presentation related to document

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handling and document accountability have been prepared, and the narrative is in the final editing stage.

The security indoctrination audiovisual presentation for new hires, rehires, and transfers was shown to 65 employees this quarter.

The security responsibility indoctrination for terminating employees was presented to 54 terminating employees.

EMPLOYEE AND LABOR RELATIONS

Arbitration

1. All of the six grievances pending arbitration hearing have been withdrawn by the Union prior to such hearing. The arbitrators and the Mediation Service have been notified.
2. On January 28, the Local CIO Union appealed two grievances to arbitration. In one case a Helper Trainee protested the denial of his merit-progression increase, and in the other case a Welder protested the refusal of a Company Doctor to authorize insurance payment, thus depriving him also of makeup pay for one day. An Arbitrator has been selected to hear these grievances, but the hearing date has not been set.
3. On March 13, 1969, the Local CIO Union appealed five additional grievances to arbitration. One case concerns a jurisdictional dispute between Laborers and Stores Clerks; in two grievances, an Electrical Mechanic and a Sheet Metal Worker claim they were denied voting time with pay; one grievance involves vacation schedules for Operators; and in one case, an Operator claims that a call-in deprived him of overtime. An Arbitrator has not been selected to hear these cases.
4. At the close of the quarter, there are seven grievances pending in the Arbitration Procedure.

Stipulations

On January 10, two stipulations were signed by the Company and Local 109 of the International Plant Guard Workers' Union, as follows:

1. Effective January 9, 1969, an employee who is eligible for four weeks or more of vacation may take two weeks of this vacation in portions of one or more whole days.
2. The contract was amended so that Washington's Birthday and Memorial Day will be observed on the calendar holiday.

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TABLE E-2

FORCE REPORT

	<u>Current Quarter</u>	<u>Previous Quarter</u>	<u>1968^a</u>	<u>1967^a</u>	<u>1963 1967^a</u>
<u>Type of Personnel</u>					
Production	321	322	315	304	327
Fab. & Maintenance	1021	1002	981	977	982
Lab. & Dev.	445	443	424	391	362
Staff Services & Others	892	897	934	915	872
Total	2678	2664	2654	2587	2543
<u>Type of Payroll</u>					
Hourly	1059	1052	1050	1065	1096
Weekly	785	800	804	762	716
Monthly	834	812	800	760	731
<u>Sex</u>					
Males	2262	2245	2234	2189	2165
Females	416	419	421	398	378
a) Quarterly Average					

TABLE E-3

LABOR TURNOVER

	<u>Current Quarter</u>	<u>Previous Quarter</u>	<u>1968^a</u>	<u>1967^a</u>	<u>1963 1967^a</u>
Labor Turnover Percent	1.64	1.21	1.95	2.16	1.87
<u>Reason for Termination</u>					
Resigned	32	15	34	41	25
Reduction in Force	0	0	3/4	1/2	8
Discharged	0	2	1/2	1/2	1/3
Deceased	0	2	3	4	2
Retired	9	13	11	6	6
Military Induction	0	0	1	2	1
Transfers Out	2	8	18	7	7
Disabilities	3	0	1	1	7
Total	46	40	70	62	56
Rehires & Reinstatements	20	20	26	26	16
New Hires	36	47	48	56	34
Transfers In	7	15	9	5	6
Total	63	82	83	87	56
a) Quarterly Average					

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with a pressure input and an electrical output, are being pursued. The target performance specifications include an accuracy of 0.1% and an upper temperature limit of 250°F, although some relaxation of the accuracy target may be desirable to meet the short-term needs of the plant. The accuracy of the Taylor pneumatic transmitter used widely throughout the gaseous diffusion process is about 0.5%.

The Taylor Instrument Companies' hybrid unit, consisting of the input section from the pneumatic unit adapted to their electromagnetic feedback section (suggested by ORGDP), has not proved out and further work on it is suspended. However, Taylor will loan ORGDP two standard transmitters of a new design, with materials of construction compatible with UF₆, for test and evaluation. The overall accuracy is expected to be approximately 0.25%. Five standard transmitters of a new design are on order from the Foxboro Company, three for noncorrosive gas service and two for UF₆ service. The two units for corrosive service will be tested and then installed in the Test Loop for in-service evaluation. The accuracies of these transducers are expected to be 0.25% or better. Work has continued in-house, on the combination of a Taylor pneumatic primary (input) assembly with a Foxboro electromechanical (output) assembly, with promising results. Linearity is within 0.1%, but drift of present test units is excessive. Also, a pressure gauge with a digital readout manufactured by Dressen Industries is being investigated. This unit has a claimed accuracy of 0.05% and is compatible with UF₆ but is limited to an upper temperature of 125°F. Dressen advises that they are seeking to increase this upper limit, add an output continuous signal, and provide for both absolute and differential pressure inputs as well as the present gauge pressure input.

Corrosive Gas Chromatography: Determination of PPM Levels of UF₆ at the Purge Vent

Gas chromatography is being investigated for the determination of PPM levels of UF₆ in vent gas from the ORGDP purge system. Purge gases are passed to vent through alumina or sodium fluoride chemical traps before being diluted for exhausting to the atmosphere. For purposes of cascade efficiency and atmosphere pollution control, the gases leaving the traps must be monitored for uranium content. Control is now maintained by laboratory chemical analysis of gas samples, and by a continuous ionization monitor. The ionization monitor requires frequent maintenance due to contamination by uranium deposits, while chemical determination involves delays associated with sampling and laboratory analysis. The gas chromatographic analysis approach may eliminate these problems and permit more reliable process control.

The laboratory automatic corrosive gas chromatograph has been placed temporarily in the purge cascade to determine the feasibility of this application. Preliminary results are encouraging. Tests will be continued to determine optimum operating conditions, possible interferences, and maximum achievable sensitivity.

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DISTRIBUTION

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Date of request 9/14/95 Expected receipt of document 10/14/95

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K/EM-339

**SANTITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION
PLANT QUARTERLY REPORT THIRD QUARTER FISCAL YEAR 1976
(JANUARY 1 THRU MARCH 31, 1976)**

(EXTRACTED FROM CRD DOCUMENT # K-1919)

**Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement**

December 21, 1995

**Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400**

This document has been approved for release
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Date of Issuance: May 28, 1976

K-1919

K 1919 27 A



PLANT RECORDS RECEIPT NO.
K87393

OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT (U)

THIRD QUARTER FISCAL YEAR 1976
January 1, 1976 through March 31, 1976

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This document is based on a ~~SECRET~~ ~~CRD~~ ~~100195~~
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P. S. Cates
P. S. Cates

Classifying Official
Superintendent, Operations
Planning Department
Title

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Table C-7

URANIUM-235 INPUT
(Kilograms U-235)

Second Quarter FY 1976				Third Quarter FY 1976			
<u>Month</u>	<u>Total</u>	<u>Daily Rate</u>	<u>% Change</u>	<u>Month</u>	<u>Total</u>	<u>Daily Rate</u>	<u>% Change</u>
October	4,704	151.8	11.8	January	5,163	166.5	5.6
November	4,507	150.2	-1.1	February	4,463	153.9	-8.2
December	4,873	157.2	4.5	March	5,098	164.5	6.4
Total	14,084			Total	14,724		
Average		153.1	11.1	Average		161.8	5.4

Table C-8

CASCADE INVENTORY CHANGE

<u>Month</u>	Second Quarter FY 1976			
	Uranium-235		Enriched U-235	
	<u>Ending Inventory</u>	<u>Δ</u>	<u>Ending Inventory</u>	<u>Δ</u>
October	1,662	170.33	372	14.44
November	1,739	76.93	425	53.21
December	1,632	-106.68	297	-128.41
Total		140.58		- 60.76
<u>Month</u>	Third Quarter FY 1976			
	Uranium-235		Enriched U-235	
	<u>Ending Inventory</u>	<u>Δ</u>	<u>Ending Inventory</u>	<u>Δ</u>
January	1,866	233.54	398	101.77
February	1,840	- 25.62	406	7.23
March	1,967	127.14	415	9.27
Total		335.06		118.27

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EFFICIENCIES AND PURGE RATES

Cascade Efficiency

Based on the separative work concept, the January, February, and March cascade efficiencies were 99.75%, 99.80%, and 99.70%, respectively, for a quarterly average of 99.75%.

On-Stream Efficiency

The cascade on-stream efficiency during the third quarter of FY 1976 averaged 99.44%. Excluding off-stream time attributable to the plant test program and power control, the efficiency averaged 99.47%. Cascade off-stream hours are given in Table C-9.

The quarterly efficiency for the cascade buildings averaged 99.43% for K-33, 99.29% for K-31, and 99.97% for K-29.

PURGE CASCADE

The normal purge rate at K-311-1 during the third quarter, FY 1976 averaged 14,037 scf per day. The highest monthly average was in February when 14,207 scf per day was purged. The January and March rates were 14,177 and 13,726, respectively.

New Purge Cascade - K-402-9

At the end of February, operational checks had been completed on all cells and booster stations, the instrument and electrical systems had been checked out, and the hoist for the top booster had been installed. The project was completed within the authorized funding.

An attempt to place the new purge cascade on-stream in early March was unsuccessful. The cell instruments and controls were rechecked and an intensive training program for Operations and Maintenance personnel was 75% complete at the end of March.

On March 11, the inadvertent opening of the K-402-9.6 evacuation valve resulted in the release of less than 225 grams uranium.* The alumina traps aided in reducing the quantity of the release. No significant health physics or environmental impact resulted.

*J. C. Bailey, et al, *UF₆ Release at K-402-9 March 11, 1976, May 14, 1976, K-P-6257, UNCLASSIFIED.*

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K-1401 Converter Shop

PEM/PEU: Assembly of the fourth cell of PEM converters and uprating of the third cell of PEU converters were completed in January. Assembly of the fifth PEM cell was completed and the sixth PEM cell was begun in March.

Purge Cascade: Assembly and stabilization of the twenty-fourth high speed converter for the purge cascade were completed in early March.

NUCLEAR MATERIALS MANAGEMENT

The nuclear materials management program is designed to exercise suitable controls over the movement of source and special nuclear materials. This involves surveillance of material balance experience by individual process and maintenance of necessary quality control systems for weights and analyses of samples.

Cascade Material Balance

The third quarter calculated cascade material balance is given in Table C-17.

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Table C-17

CASCADE MATERIAL BALANCE SUMMARY

Third Quarter FY 1976	Kilograms	
	Uranium	Uranium-235
January	4,717	19
February	3,580	-47
March	-1,803	- 5
FY through March	5,523	-46

Cumulative Plant Account Efficiency

Estimated quantities of material representing the hidden inventory are shown by categories in Table C-18. The plant efficiency was 99.93% for uranium and 99.87% for uranium-235. Cumulative plant uranium and uranium-235 material balance data are shown in Figure C-3.

Table C-18

ACCOUNTING MEMORANDUM

Location of Deposit or Source or Hidden Inventory	Kilograms	
	Uranium	Uranium-235
STATION FZA		
K-1405 Holding Pond	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
Dilution before July, 1955	-	179.2
Total Station FZA	14,042.8	288.1
STATION BWA		
Cascade:		
Inactive Consumption	16,351.8	1,387.9
Active Chemisorption	665.7	54.8
Physical Absorption	625.3	7.0
Inactive Converters	92.8	2.7
Total Station BWA	17,735.6	1,452.4

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DWG. NO. G-74-969 (R1)
(SRD)

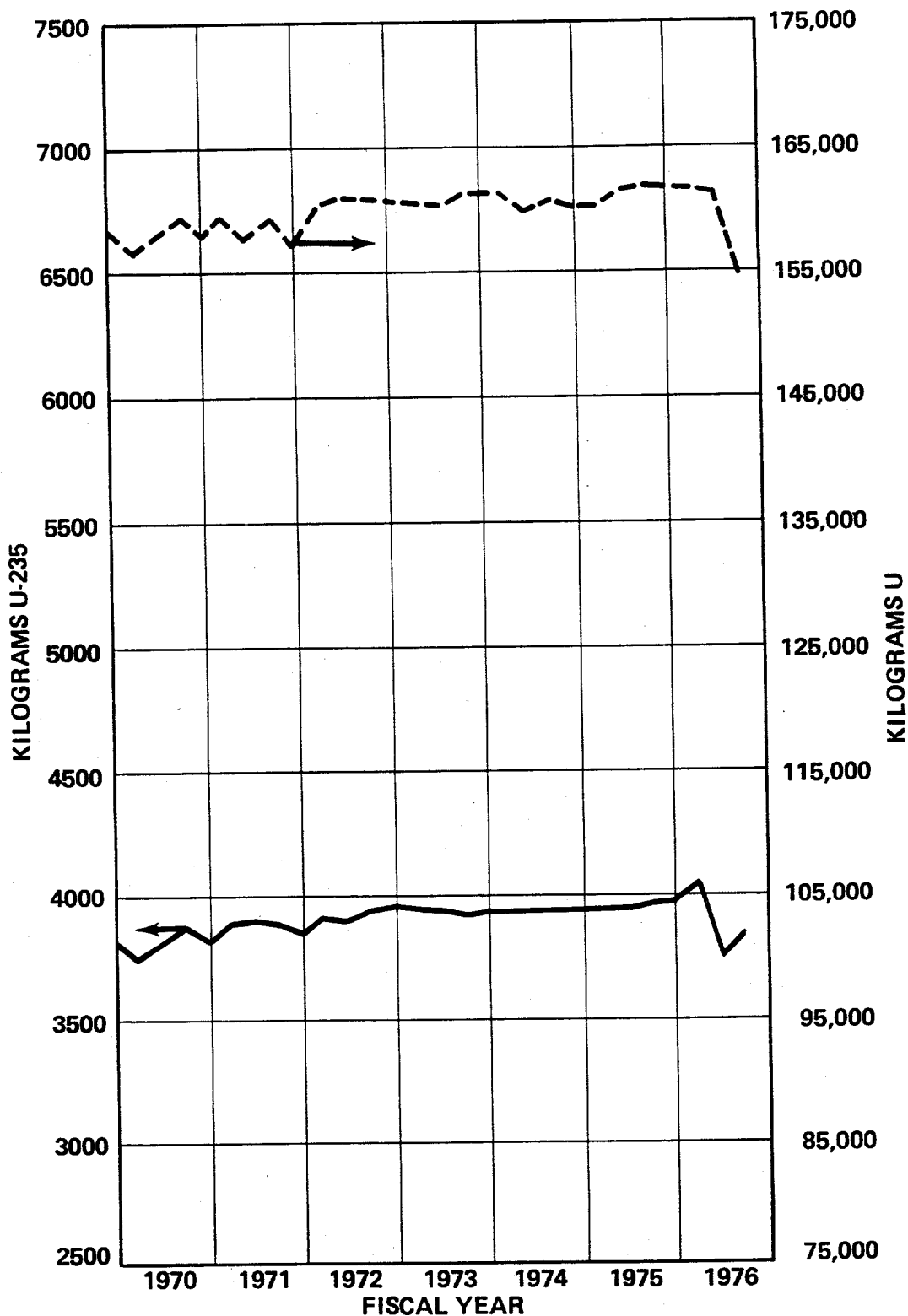


Figure C-3
CUMULATIVE PLANT U AND U-235 MATERIAL UNACCOUNTED FOR
(September 9, 1944 through March 31, 1976)

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MECHANICAL SAFETY

Routine inspections and tests of 215 pressure vessels showed that 160 (74.4%) were in satisfactory condition. The majority of the unsatisfactory conditions related to unsealed safety and bypass valves on coolant condensers. Pitting was found in the lower head of the steam plant deaerating heater, repair of which is planned for during the next outage. Relief protection had to be provided for two new heat exchanger installations. Leak tests of the natural gas lines on the south side of Building K-1037 showed numerous leaks which were repaired.

Routine inspections and tests of 523 pressure relief devices showed five unsatisfactory conditions. Relief valves on a nitrogen line to a varnish tank and on a water heater in Building K-1401 were inoperative, and a stop valve on an air receiver in Building K-731 was found to be closed. The hydraulic relief valve on the elevator in Building K-1007 opened at 600 psig instead of its 300-psig setting; apparently someone had tampered with the spring adjustment. Routine inspection of a paint spray pot disclosed that its 110-psig safety valve had been replaced with one set at 2,000 psig. All of these conditions were promptly corrected.

Furnace, oven, and calciner inspections included Autoclave Nos. 3 and 4 in Building K-1037, the T-4 Cracker Facility in Building K-1037, and the three calciners in Building K-1420. All contained violations of Furnace and Oven Code requirements, correction of which are planned or are in progress.

Two new backflow preventers were installed in sanitary water systems this period, making a total of nine installations in the plant. Routine tests of these devices showed three to be in need of repairs. After repairs were performed, all operated satisfactorily.

Routine inspections of 787 units of hoisting and material handling equipment showed that 750 (95.3%) were in satisfactory condition. Unsatisfactory conditions, which were promptly repaired, included damaged cables on an overhead crane and on a high horse scaffold in Building K-1131, a broken hydraulic line and a loose bolt in the bridge brake linkage on a 15-ton crane in Building K-31, and a weld crack in the web of a bridge girder on a 10-ton crane in Building K-1401. Magnetic particle inspections of 235 load hooks showed the hook on one hoist to be cracked. This hook was replaced and the cracked one was submitted for metallurgical examination.

Monthly inspections of running ropes on overhead cranes showed all to be satisfactory. However, recently instituted weekly checks of the cables on Building K-1401 cranes showed that the cable on one crane was cross-wound on the drum. This was promptly corrected.

The plant-wide identification, evaluation, inspection, and tests of lifting fixtures continued. A total of 1,788 slings and lifting fixtures were inspected and/or tested with 1,693 (94.7%) being satisfactory.

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Following two incidents in which the cable unreeled from the drum of a K-1401 crane and fell into the Clean Area pit, a lower limit switch was installed; two other cranes in the same bay will be similarly equipped.

There were three other crane and hoist incidents this period. The hoist cable on a 20-ton crane in Building K-1401 separated when it wedged between the overhead sheave and the sheave guard assembly. A 40-ton crane in Building K-33 lowered a load in an uncontrolled manner because the hoist motor brake vibrated out of adjustment. The load chain on a 1-ton hoist in K-131 broke when the upper limit switch failed, permitting a *two-block* condition.

Receiving inspections and tests of 2,166 compressed gas cylinders showed that 3% contained unacceptable conditions such as leaks at safety devices, valve threads, valve packing, or gages. A few were empty or past due for retest.

Receiving inspections of 46 portable ladders showed that only 34 (74%) were acceptable for plant use. Ladders that did not meet specification requirements and those with shipping damage were returned to the vendor for replacement or repair. Of 176 used ladders inspected and/or tested, 115 (65.3%) were approved for continued use.

Receiving inspections and tests of 232 lengths of new welding hose showed that 227 (97.8%) were acceptable for use. Of 122 lengths of used hose inspected, 56 (56.6%) were approved for continued use.

Receiving inspections and tests were performed on 94 regulators for compressed gas cylinders. Ninety (95.7%) of the regulators were accepted. Leakage through the diaphragms accounted for the rejects.

The rebuilding of 1-in. valves for UF₆ cylinders continued. Of 349 valves inspected and tested, 338 (96.8%) were accepted for use.

A summary of Mechanical Safety inspections and tests is given in Table E-1.

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Table E-1

MECHANICAL SAFETY INSPECTIONS AND TESTS

<u>Inspections and Tests</u>	<u>Third Quarter FY 1976</u>	<u>Second Quarter FY 1976</u>	<u>1975(a)</u>	<u>1971- 1975(a)</u>
<u>Pressure Relieving Devices</u>				
Number Tested, Repaired, or Replaced	523	417	475	481
Number Satisfactory(b)	518	416	474	477
Percent Satisfactory	99.0	99.8	99.8	99.2
<u>Boilers and Pressure Vessels</u>				
Number Inspected or Tested	215	274	286	254
Number Satisfactory(b)	160	248	279	233
Percent Satisfactory	74.4	90.5	97.6	91.7
<u>Hoisting Equipment</u>				
Number Inspected or Tested	787	643	696	466
Number Satisfactory(b)	750	593	649	416
Percent Satisfactory	95.3	92.2	93.2	89.3
<u>Slings and Lifting Fixtures</u>				
Number Inspected or Tested	1,788	3,024	1,934	1,221
Number Satisfactory(b)	1,693	2,506	1,772	1,135
Percent Satisfactory	94.7	82.9	91.6	92.9
<u>Compressed Gas and UF₆ Cylinders</u>				
Number Inspected or Tested	490	660	372	7
Number Satisfactory(b)	476	577	341	273
Percent Satisfactory	97.1	87.4	91.7	94.5

(a) Quarterly averages.

(b) Includes those with minor defects not affecting safe operation.
Corrective actions were taken when required.

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HEALTH PHYSICS

Personnel Radiation Monitoring

Analyses of 713 urine specimens for uranium and alpha activity for the period January 1 through March 31, 1976, identified nine employees that exceeded the Plant Action Guide (PAG) limits for a single sample. Included were five Chemical Operators involved in transferring and sampling UF₆ cylinders, a Chemical Operator involved in field decontamination and three Maintenance Mechanics working in the cascade.

Subsequent follow-up specimens showed that the uranium excretion rates had decreased in each instance to levels below the PAG limits and that there was no significant retention of uranium.

Airborne Uranium Alpha Activity

The average alpha activity levels reflected by 1594 routine shift-length samples, recorded by continuous monitoring units in locations where air contamination is suspected, remained essentially unchanged and low, representing about 8% of the ERDA Radiation Protection Standard (RPS) of 10^{-10} μ Ci uranium/cc of air. The average alpha activity from 677 shift-length air samples, taken at four outdoor locations around the plant perimeter downwind from major stack discharges, was less than 4% of the RPS.

Iodine-131 Collection Studies

[Keywords: Iodine-131]

Health physics guidance was provided to personnel from the Materials and Systems Development Department who are studying the absorption process for removing elemental iodine and methyl iodide from the off-gases of a fuel reprocessing plant.

Training and Education

Representatives of the Y-12 Plant Radiation Safety Department presented 1-hr illustrated health physics lecture-demonstrations to nine groups of supervisors, marking the beginning of a series of meetings at which the same material will be presented to an estimated 2000 ORGDP craft employees and supervisors.

Routine Area and Special-Request Surveys

ORGDP Health Physics Technicians performed 209 routine area surveys and surveyed and tagged 28 motors for shipment to National Electric Coil Co. The Technicians also monitored and tagged 6589 pieces of decontaminated equipment or materials in Building K-1420 and 1131 other items.

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CRITICALITY SAFETY

Random audits of uranium processing and storage areas within ORGDP have been continued and no significant incidents have been observed.

Twenty-one permanent Criticality Safety Analyses were issued to CTF for near completion of the Consolidated Criticality Safety Analysis Report (CCSAR) for the CTF. Four temporary Criticality Safety Analyses were issued to the Operations Division of which three were issued for temporary processes at the K-1420 Facility and one for temporary cleanup of K-402-9 Purge Cascade piping. Two permanent Criticality Safety Analyses were issued to the Operations Division. One for storage at the K-1420 Facility and one for process equipment within K-402-9.

Six general Criticality Safety Meetings were presented, two for Laboratory Division personnel and four to K-1401 Converter Shop personnel. One technical Criticality Safety Meeting was presented to Operations Division personnel in K-1420. One training Criticality Safety Meetings was presented to Operations Division new-hire personnel.

The following topics or processes were reviewed for feasibility and restrictions for proposed future projects involving the handling or storage of fissile material:

1. K-1420 Raffinate Disposal
2. K-402-9 Purge Cascade Scrubber System
3. ORGDP Burial Ground relocation
4. K-902-8 Test Loop
5. Cleaning of K-402-9 Purge Cascade piping
6. K-1420 contaminated oil disposal to Y-12

INDUSTRIAL HEALTH EXAMINATIONS AND CLINICAL URINALYSIS

There were no chest and/or sinus x-rays made during the quarter.

Sixty-four employees on the routine programs submitted urine specimens for chemical analysis at the field collection stations. One of the laboratory tests indicated results above the threshold limit value for the material of concern for a single sample; follow-up value was normal.

A summary of the medical case loads for the FY 1976 second and third quarters is given in Table E-2.

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A summary of the medical case loads for the FY 1976 second and third quarters is given in Table E-2.

Table E-2

MEDICAL CASE LOAD

<u>TYPE CASE</u>	<u>Second Quarter FY 1976</u>	<u>Third Quarter FY 1976</u>
Industrial Injuries & Illnesses	949	1,561
Nonindustrial Injuries & Illnesses	2,619	3,313
Preemployment & Rehire Examinations	486	986
Preemployment Rejects*	1	3
Terminations	30	62
Periodic Examinations	598	260
Interim Examinations	13	0
Industrial Health Examinations	11	44
Optometric Visits	2,373	3,129
Returns to Work, Recalls & Miscellaneous	<u>4,458</u>	<u>3,573</u>
Total Case Load	11,537	12,928
Services to Outside Parties (Included in Case Load)	112	81
Laboratory Procedures Completed	10,978	12,393
Electrocardiograms	561	637
X-rays Made	1,498	1,694

*Included in Preemployment & Rehire Examinations

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PERSONNEL AND LABOR RELATIONS

ARBITRATION

Of the 42 grievances pending arbitration at the end of the second quarter, 28 were withdrawn by mutual consent. They were LRG 52-L, 186-L, 209-L, 213-L, 256-L, 261-L, 265-L, 287-L, 302-L, 305-L, 306-L, 307-L, 314-L, 315-L, 317-L, 328-L, 333-L, 342-L, 343-L, 344-L, 345-L, 349-L, 352-L, 357-L, 364-L, 365-L, 367-L, and 371-L.

Grievances LRG 157-L, 161-L, 191-L, 195-L, 224-L, 231-L, 247-L, 320-L, 334-L, 353-L, 361-L, 375-L, and 391-L are still pending.

Grievance LRG 96-G was heard in arbitration on February 17, 1976, before Arbitrator J. F. Caraway. The Union's contention was that the Company changed working conditions allegedly agreed to with the Union in 1966. The alleged change in working conditions involved the removal of weapons from the portals to a vault at Guard Headquarters and requiring the Guards to obtain their weapons from the vault instead of at the portals. The Company's post-hearing brief was submitted on March 19, 1976, and the disposition of the case was pending at the end of this report period.

Arbitrator George Moskowitz has been selected to hear LRG 361-L. The hearing date is set for May 27, 1976.

During the quarter, 10 additional grievances were appealed to arbitration, 6 of which were withdrawn during the quarter. Those remaining appealed to arbitration are:

LRG 383-L

Barrier Operators protest the Company's action of assigning one Barrier Operator to perform work which they claim should require two employees.

LRG 13-M

Truck Driver S. A. Grider alleges that the Company is denying hourly employees the opportunity for overtime by allowing salaried personnel to pick up and transport material.

LRG 30-M

The Union protests the discharge of Machinist _____ on 1-19-76 for excessive absenteeism.

LRG 48-M

Operators protest being assigned to clean equipment alleging that this work is completely outside the realm of routine housekeeping.

At the end of the quarter, 17 grievances are still pending arbitration.

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PERSONNEL STATISTICS

Tables E-3 and E-4 are comparisons of personnel statistics during the FY 1976 second and third quarters and FY 1974 and FY 1975 quarterly averages.

Table E-3

FORCE REPORT

<u>Type of Personnel</u>	<u>Third Quarter</u>	<u>Second Quarter</u>	<u>Quarterly Average</u>		
			<u>1975</u>	<u>1974</u>	<u>1970 1974</u>
Production	991	854	765	525	387
Fab. & Maintenance	2308	2152	2028	1539	1234
Laboratory & Development	924	901	853	660	542
Staff Services & Others	1104	1081	1061	935	872
Total	5327	4988	4707	3659	3035
<u>Type of Payroll</u>					
Hourly	2610	2353	2171	1490	1186
Weekly	1263	1235	1188	999	864
Monthly	1454	1400	1348	1170	985
<u>Sex</u>					
Males	4442	4175	3931	3052	2556
Females	885	813	776	607	479

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Table E-4
LABOR TURNOVER

	<u>Third Quarter</u>	<u>Second Quarter</u>	<u>Quarterly Average</u>		
			<u>1975</u>	<u>1974</u>	<u>1970 1974</u>
Labor Turnover Percent	1.34	1.24	1.65	1.72	1.86
<u>Reason for Termination</u>					
Resigned	44	35	44	36	37
Lay-Off	0	0	1	2	2
Discharged	5	3	3	1	1
Released by Company	0	0	2	1	0
Deceased	2	1	2	2	3
Retired	15	18	14	11	11
Military Induction	0	0	0	1	1
Transfers Out	12	13	11	27	15
Disabilities	3	4	3	5	5
Total	81	74	80	86	75
Rehires & Reinstatements	39	16	32	36	25
New Hires	368	161	185	189	69
Transfers In	13	12	115	26	42
Total	420	189	332	251	136

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SECURITY

Classified Facilities

Twelve companies were visited to conduct security surveys. Thirty bid interests were established at cleared facilities and four were deleted. Nine contracts were awarded for classified fabrication and six were deleted. Four new facilities were established as cleared for classified operation and six were deleted.

Visitor Control

The Visitor Control Section arranged for 4021 visits to ORGDP and 653 visits to other facilities. Two thousand thirteen of the visits to ORGDP were classified, 1511 of which were handled by the Section and 502 were coordinated through ERDA. (The combined total of 4674 visits handled compares with a quarterly average of 3569 for 1975).

Personnel Security Clearances

ORGDP Employees. Clearances were requested for 443 prospective employees. Of the total, 349 were for initial clearances (157 "Q" and 192 "QL") and 94 were for transfers and reinstatements. Three hundred seven clearances were granted - 210 "Q", 62 "L", and 35 transfers or reinstatements. Six hundred eighty-seven prospective employees were interviewed in relation to their PSQs. (The 443 clearances requested represents an approximate increase of 67% over previous quarters, and the 687 prospective employees interviewed represents an approximate 50% increase).

Subcontractors, Vendors, and Construction. Clearances were requested for 134 individuals and 107 clearances were terminated.

Reinvestigation Program. As required under the ERDA reinvestigation program, 162 ORGDP employee PSQs were received and processed to ERDA.

Classified Shipments

There were 134 outgoing and five incoming classified shipments this quarter.

Security Education

Initial security indoctrinations were given to 409 new employees and termination briefings were given to 62 terminating employees. Special security briefings were given to 311 individuals (295 employees and 16 construction workers).

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FIRE PROTECTION

A representative of the Fire Protection Engineering Department attended a three-week seminar at the Factory Mutual Research Center.

Acceptance tests were satisfactorily conducted on the deluge sprinkler systems installed by Automatic Sprinkler Corporation in the K-832, K-861, K-892-G and K-892-H Cooling Towers.

Basic fire protection requirements were initiated for the new Central Control Facility, Propane Tank Storage, Centrifuge Process Demonstration Facility and K-802-K Cooling Tower.

Requirements and specifications for a new 1250 gpm fire pumper were finalized and bid packages issued by Purchasing to fire equipment manufacturers.

Thirteen fire alarms involving ORGDP property were responded to by the Fire Department. Monetary loss was negligible. Plant Protection personnel administered on-site first aid to 110 persons during hours the Dispensary was closed and responded to 37 ambulance transportation calls. In addition, 449.5 manhours of training was received by Fire Department personnel. Training drills were held which included fire, first aid and/or rescue operations. These totaled 1154.5 manhours on the part of participating emergency squad personnel.

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EMERGENCY ACTIVITIES

The following drills were conducted during the third quarter:

<u>Shift</u>	<u>Date</u>	<u>Category</u>	<u>Location</u>
A	March 3, 1976	Simulated fire	K-1045A
B	March 28, 1976	Oil fire	K-1045A
C	February 8, 1976	Oil fire and injury	K-902-5.3

Emergency Squad training and manhours involved are listed below.

<u>Category</u>	<u>Manhours</u>
First Aid	304
Fire Fighting	323
Masks and Suits	111
Orientation	43
Film "Tornados"	<u>47</u>
Total	<u>828</u>

A summary of Emergency Squad responses during the quarter follows.

1. On January 12, 1976, C Shift answered a call to K-33 when a coolant pipe sealant in a pipe sleeve was ignited by welding sparks.
2. On February 6, 1976, C Shift answered a call from K-31 when a compressor failed in K-31-2.2, Stage 3. The failure resulted in a thrown motor coupling, broken oil lines, and an oil spill. The spilled oil was contained with Zorball and absorbant rolls and pads.
3. On February 7, 1976, B Shift responded to a fire and smoke situation in K-1200 middle bay. A waste epoxy mix which was smoldering was extinguished.

A summary of Emergency Preparedness activity during the third quarter is given below.

1. A letter was prepared and forwarded to ERDA as a follow-up to the 1975 ORO Emergency Preparedness Appraisal.
2. An *Accident Response Capability* information form was updated and forwarded to ERDA.
3. An emergency procedure for use in the event of a tornado was prepared and is being reviewed.
4. The fatality section of the medical procedure in the Shift Superintendents' Operating Manual was updated.

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ENVIRONMENTAL MANAGEMENT

new K-1203 sewage treatment facility. Until such time as this new sewage plant is operational, the wastes have been divided into a relatively concentrated stream that is being treated and/or stored on site and a less concentrated stream that is being discharged to Poplar Creek via the K-1007-B holding pond. The various treatments afforded different segments of the concentrated stream include: (1) concentration by an evaporator, with the concentrate being stored in the K-1407-C retention basin, (2) biodegradation in the K-710 sewage plant, (3) concentration by a reverse osmosis unit, and (4) storage in the K-802-H cooling tower basin, with the K-1407-C retention basin as a backup.

As of April 1, 1976, the K-802-H cooling tower basin had a capability of containing approximately 250,000 additional gallons of waste. This capability would have provided most of the storage capacity needed prior to initiation of treatment in the new sewage plant which was scheduled for completion by April 15, 1976. However, with the slippage of the completion date to mid or late May, additional storage capacity was required. To provide this capacity, the K-1407-C retention basin was enlarged and upgraded, primarily by increasing the height and width of the berm around the basin.

The capacity of the K-1407-C basin should provide the storage volume needed until such time as the new sewage plant is capable of handling the waste stream (probably around the first to middle of July, 1976). However, it will be utilized only after the K-802-H basin has been filled.

Steam Plant - Electrostatic Precipitators

Bids on the ORGDP precipitators were opened on February 24, 1976. The bids were reviewed by ERDA and UCC-ND personnel and the contract for approximately \$775,000 was awarded to Envirotec Engineering on March 30, 1976. Barring any further delays in procurement, it appears that the installation deadline of October 1, 1977 can still be met.

Sampling Program

The Environmental and Effluent Sampling Program for ORGDP was revised during this quarter. The program was updated to include additional parameters as required by NPDES Permit No. TN0002950. Several sampling changes recommended by the Ecological Sciences Division of ORNL in the Environmental Assessment of the Oak Ridge facilities were also included in the new program. These include additional vegetation and soil sampling and periodic sampling of the biota in the ambient water systems.

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Because of the increase in activity at ORGDP, vegetation surrounding the plant is being sampled at a higher frequency. Once a month samples are collected at six different locations (at various distances from the plant) and, subsequently, analyzed for fluoride content. These data will be useful in evaluating the effect of gaseous fluoride releases, specifically those of a seasonal nature.

UF₆ Test Releases

The first of a series of UF₆ test releases was made in the ventilation system in the K-33 building. These tests are expected to furnish the critical design criteria for the location, mounting arrangement, and quantity of UF₆ detectors needed for CIP/CUP operating conditions.

Numerous environmental air samples were taken during the first week of test releases. The maximum release rate encountered was 8.5 g/min for a total of 15 minutes. There was a total of 17 tests made between February 25 and March 25 with a total amount of 1,189.0 grams of UF₆ released. During the first thirteen tests, three air samplers were triggered during the time period of each test; one was located on the roof of K-33 and the other downwind of the release point. In addition, ambient air samplers located around ORGDP were operated. The parameters monitored were fluorides and uranium. It was ascertained that at these release rates the environmental impact of the UF₆ was negligible. Additional environmental samples will be taken when the test release rates are above 8.5 g/min.

Cascade Sampling

An investigation is under way to determine the quantity of transuranics (neptunium and plutonium) deposited within the cascade. Several converters, removed from the cascade for decontamination and modification, have been sampled for the deposited material. The results thus far are incomplete. A statistical analysis is expected to indicate the location and minimum number of cells that must be sampled in order to ascertain the total quantity of deposited transuranics throughout the cascade. In addition, samples will be taken to trace the flow of this material through the decontamination and recovery process. This information will be instrumental in projecting the behavior of transuranics in the cascade. The presence of these transuranics is expected to increase in the future due to the increased feed of reactor returns material.

K-1515 Sampling Station

While construction of the sampling station has been completed, infiltration around the dam and leaks in the culvert which passes under Bear Creek Road have made the system inoperable. Modifications are in progress to correct these problems and there is no anticipated delay in meeting the NPDES discharge permit requirements of June 30, 1976.

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New SO₂ Emission Standards

The SO₂ emission standards which were approved by the State of Tennessee Air Pollution Control Board on October 23, 1975 became effective on March 20, 1976. The State has submitted these regulations to EPA but official approval has not yet been received.

Procedure for Disposal of Mercury Vapor Lamps

Increased usage of mercury vapor lamps and ultimate disposal of failed lamps have resulted in the need for an environmentally-acceptable collection and disposal method. A procedure is being prepared.

NPDES NonCompliance Situations

The pH of K-1007-B holding pond exceeded the NPDES Discharge Permit upper limit of 9.0 on January 31, 1976. Intermittent violations of this nature continued to occur until the middle of March.

Instrumentation has been installed to automatically recycle this waste stream if the effluent exceeds the 6.0-9.0 range. This has effectively reduced the pH values at the outfall of K-1007-B. However, periodic high pH values are still being observed, and investigation of the cause is under way.

Quarterly EPA Report

The fourth quarterly EPA liquid effluent report was submitted to ERDA on January 20, 1976. The report covers the effluent monitoring data from October 1, 1975 through December 31, 1975. During this period, abnormally high pH values continued to be observed at Discharge Point 007 (K-901-A holding pond). Low chlorine residual values were again recorded at Discharge Points 005 and 008 (K-1203 sewage treatment facility and K-710-A sewage treatment facility, respectively). In addition, one low pH value was recorded at Discharge Point 008.

Emission Data

Tables E-5 through E-11 give emission data at the various ORGDP effluent locations.

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Table E-6

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1700 HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB.		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MAX.	Daily Min. Daily Avg. Daily Max.
Flow (MGD)	0.7978	1.6274	Flooded	
Aluminum, mg/l	0.28	0.39	0.60	1.0 mg/l ⁽¹⁾
Chemical Oxygen Demand, mg/l	12	22	32	
Chromium, mg/l	0.03	0.10	.22	0.05 mg/l 0.08 mg/l ⁽¹⁾
Dissolved Solids, mg/l	307	409	501	
Fluoride, mg/l	0.4	0.8	1.1	
Nitrate	54.9	60.8	70.8	90 mg/l ⁽¹⁾
Oil and Grease, mg/l	<1	<1	<1	15 mg/l ⁽²⁾
pH	5.6	7.2	9.8	9.0 ⁽¹⁾
Suspended Solids, mg/l	<5	10	18	30 mg/l ⁽¹⁾
Temperature (°F)	30	41	52	
Turbidity, JTU	2	9	23	

(1) NPDES Discharge Permit No. TN0002950 effective January 1, 1977.

(2) NPDES Discharge Permit No. TN0002950 effective now.

Table E-5

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1131 STEAM CONDENSATE DISCHARGE

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB.		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MAX.	Daily Min. Daily Avg. Daily Max.
Flow (MGD)	(2)	0.0036	(2)	0.005 mg/l 0.008 mg/l (1)
Chemical Oxygen Demand, mg/l	(2)	40	(2)	
Conductivity μ mhos	(2)	140	(2)	
pH	(2)	7.04	(2)	6.0 9.0 (1)
Temperature (°F)	(2)	102°	(2)	

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

Table E-7

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-710 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MIN.	DEC. JAN. FEB. AVERAGE	MAX.	PROPOSED EFFLUENT STANDARD	
				Monthly Avg.	Weekly Avg.
Flow (MGD)	0.00116	0.0181	0.0333		
Biochemical Oxygen Demand, mg/l	2	10	25	30	45 (1)
Suspended Solids, mg/l	<5	<13	26	30	45 (1)
Fecal Coliform Bacteria (No. per 100 milliliter)		0		200	400 (1)
pH	6.7	7.4	8.6	The pH shall not be less than 6.0 nor greater than 9.0 (1).	
Chlorine Residual, mg/l	0.0	.8	2.0	The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l. (1)	
Settleable Solids (ml/l)	<0.1	<0.1	<0.1		1.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

Table E-8

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1515 SANITARY WATER PLANT

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB.		PROPOSED EFFLUENT STANDARD		
	MIN.	AVERAGE	MAX.	Daily Min.	Daily Avg. Daily Max.
Flow (MGD)	0.054	0.108	0.216		
Suspended Solids, mg/l	<5	34	156	30 mg/l	50 mg/l ⁽¹⁾
Aluminum, mg/l	0.32	3.2	6.0		250 mg/l ⁽¹⁾
Sulfate, mg/l	15	21	26		1400 mg/l ⁽¹⁾
Chemical Oxygen Demand, mg/l	7	12	19		
pH	6.7	7.2	7.6		

(1) NPDES Discharge Permit No. TN0002950 effective July 1, 1976.

(2) NPDES Discharge Permit No. TN0002950 effective now.

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Table E-9
EMISSION DATA AT ORGDP EFFLUENTS
Location: K-901-A HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB.		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MAX.	Daily Min. Daily Avg. Daily Max.
Flow (MGD)	1.204	2.399	4.988	
Chemical Oxygen Demand, mg/l	19	22	26	0.05 mg/l (1)
Chromium, mg/l	3.2	3.5	3.8	
Dissolved Oxygen, mg/l	12.0	13.6	15.4	
Fluoride	0.19	0.23	.30	1.0 mg/l (1)
Oil and Grease, mg/l (2)		<1		15 mg/l (1)
Suspended Solids, mg/l	<5	<7.5	13	30 mg/l (1)
Turbidity, JTU	2	7	20	
pH	8.4	9.1	10.7	9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

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Table E-10

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1007-B HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MIN.	DEC. AVERAGE	JAN. AVERAGE	FEB. MAX.	PROPOSED EFFLUENT STANDARD	
					Daily Min.	Daily Avg. Daily Max.
Flow (MGD)	1.454	>2.739	>5.707			
Suspended Solids, mg/l	<5	<8	11		30 mg/l	45 mg/l (1)
Chemical Oxygen Demand, mg/l	4	10	13		20 mg/l	25 mg/l (1)
Chromium, mg/l	0.02	0.03	0.05			0.05 mg/l (1)
Dissolved Oxygen, mg/l	6.0	12.0	17.0		5.0 mg/l (1)	
Fluoride, mg/l	0.30	.44	0.56			
Oil and Grease, mg/l	<1	<1	<1		10 mg/l	15 mg/l (1)
pH	7.3	8.2	10.0			9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

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Table E-11

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1203 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB.		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MAX.	Monthly Avg. Weekly Avg.
Flow (MGD)	0.370	0.518	1.040	
Biochemical Oxygen Demand, mg/l	3	25	57	15 20 (1)
Suspended Solids, mg/l	<5	<17	42	30 45 (1)
Chlorine Residual, mg/l	0	0.9	2.0	The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l. (2)
pH	6.2	6.9	7.7	The pH shall not be less than 6.0 nor greater than 9.0. (2)
Fecal Coliform Bacteria (No. per 100 milliliter)	0	0	0	200 400 (1)
Settleable Solids, ml/l	<0.1	<0.2	<0.5	The settleable solids shall not exceed 0.5 ml/l.
Ammonia Nitrogen, mg/l	2.6	3.8	5.5	5 7 (1)

(1) NPDES Permit No. TN0002950 effective July 1, 1976.

(2) NPDES Permit No. TN0002950 effective now.

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Table E-12

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1410 NICKEL PLATING FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	DEC. JAN. FEB.		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MAX.	Daily Min. Daily Avg. Daily Max.
Flow (MGD)		0.0072		
Cyanide, mg/l		0.002		0.001
Oil and Grease, mg/l	<1	<1	<1	10 15 ⁽¹⁾
Nickel, mg/l		5.0		
pH	6.6	7.2	10.6	6.0 9.0 ⁽¹⁾

(1) NPDES Discharge Permit No. TN0002950 effective now.

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The monitoring system consists of a very sensitive hydrogen sensor, a gas sampling system, a trap for removing corrosive gases, and proper valves for balancing the flows from all sampling points. The sensor is an adaptation of the commercially available Taguchi Gas Sensor developed and marketed by Figaro Engineering, Inc., Osaka, Japan. It has good sensitivity to hydrogen, propane, alcohol, gasoline, and acetone. The sensor and its circuitry were packaged to meet ORGDP requirements by Delcor Industries, Yonkers, New York.

A Probe for Locating Outleakage Points of Acid Gases

[Keywords: Corrosive Gas Leak Locator]

A simple probe device for pinpointing the location of fluorine, hydrogen fluoride, and UF_6 leaks has been developed, and is presently being field tested at ORGDP. Such a device is a valuable aid to operations personnel where fixed location detectors sense a leak in the area but the leak itself is of such a size as to be otherwise invisible.

The probe consists of a reagent capsule and light assembly mounted on a 4-ft-long rod of insulating material. Vapors from the reagent capsule convert acid gases to smoke, making concentrations of about 200 ppm of such gases visible to the operator at distances of at least 5 ft from the leak. The insulated handle and lighted tip make it safe and convenient to explore dark and hard-to-reach areas. A vapor-tight Teflon cover over the vaporizer makes it convenient to store the probe in a ready-to-use condition. The probe has undergone several months of field testing and has been used successfully to locate minute hydrogen fluoride and fluorine leaks at plant facilities where these gases are used.

Corrosive Gas Chromatography: Process Instrumentation

[Keywords: Gas Chromatography; Process Instrumentation]

A new Bendix process gas chromatograph has been installed in the new purge cascade in Building K-402-9. This chromatograph will monitor the concentrations of Coolant-114, ClF_3 , and several other gases of interest. Final adjustments and calibrations of the analyzer are now under way.

This is the second of two automated corrosive gas chromatographs built to ORGDP specifications by the Bendix Corp. Several modifications to both analyzers were carried out in the K-1035 Instrument Shops. The first analyzer is installed in the old purge cascade at K-311-1, where it has been successfully monitoring Coolant-114 and ClF_3 .

Carbon Monoxide Monitors

[Keywords: Carbon Monoxide Monitors]

Difficulty has been experienced in keeping the six K-1037 carbon monoxide monitors operating properly. When initially installed, these instruments operated for 6 months or more with no maintenance required. Usable monitor operation time has now decreased drastically, with all six monitors, so that a monitor may become inoperative within a week after servicing.

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Portsmouth Plant. Last year, the Portsmouth design was successfully modified for the CUP. However, later attempts to similarly modify the ORGDP design were not successful because of the weaker wedge and spreader assembly. An analysis of the problem indicated that these members were deflecting and twisting excessively when load was applied during opening of the valve.

Additional shop modifications have now been started on the ORGDP 30-in. valve wedge. After modification, it is planned to test the valve on the static tester. If this test is successful, it will be followed by a test in the Portsmouth test loop. If the static test is not successful, then more extensive design changes will be incorporated to strengthen the wedge and spreader assembly.

SURVEY OF POTENTIAL OIL CONTAMINATION FROM VACUUM AND COMPRESSED AIR SYSTEMS IN ORGDP SHOPS AND TEST AREAS

[Keywords: Safety; Vacuum Pumps; Compressed Air--Contamination]

The UF₆ release on September 17, 1975 was believed to have been caused by inadvertent siphoning of oil from a vacuum pump system into a cylinder being prepared for subsequent filling with UF₆.^{*} Subsequent to that incident, a committee was formed to seek additional conditions and practices at ORGDP which could lead to similar unsuspected oil contamination and subsequent problems of safety or equipment damage. This committee, appointed by J. D. Nicol of the Maintenance Division, surveyed the vacuum and compressed air systems and practices followed in their use in the shops and test areas in Buildings K-1401, K-1403, K-1035, K-1098-E, and K-303-1. In most areas, oil contamination would present no problem, or it is already adequately controlled. Three areas were found, however, where oil contamination of the equipment being prepared or tested could lead to subsequent safety hazards or equipment damage. Suggestions for correction of these situations are incorporated in a report^{**} recently issued.

ELECTROLESS NICKEL PLATING OF EXPANSION JOINTS

[Keywords: Electroless Nickel Plating; Expansion Joints]

The steel flanges on two, 4-in. expansion joints were plated with electroless nickel. Plating was required to provide surfaces which were less reactive to UF₆ process gas and to provide a smooth area on the gasket sealing surfaces.

^{*}*Investigation of a Uranium Hexafluoride Release Incident on September 17, 1975 in the K-1423 Toll Enrichment Facility (U), Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, December 9, 1975 (K-P-6197). OFFICIAL USE ONLY.*

^{**}*Barringer, R. E., Melroy, P. E., and Tredinnick, F. B., Survey of Possible Oil Contamination from Vacuum and Compressed Air Systems, Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, March 22, 1976 (K-TL-561). UNCLASSIFIED.*

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K/EM-363

**SANTIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION
PLANT QUARTERLY REPORT SECOND QUARTER FISCAL YEAR 1960**

(EXTRACTED FROM SRD DOCUMENT # K-1451)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 21, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

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Document has been approved for release
by B.G. Kortman/sst 3/1/96
Information Officer
Oak Ridge Site

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No. 22 of 84 copies, Series A.

DATE OF ISSUE: April 29, 1960

REPORT NO. K-1451

K 1451 22 A



L-35372

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OAK RIDGE GASEOUS DIFFUSION-PLANT QUARTERLY REPORT

SECOND QUARTER FISCAL YEAR 1960

October 1, 1959 thru December 31, 1959

Renues / SRD
Classification changed to SRD
(level and category)
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UNION CARBIDE NUCLEAR COMPANY DIVISION OF UNION CARBIDE CORPORATION

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- OAK RIDGE GASEOUS DIFFUSION PLANT • OAK RIDGE Y-12 PLANT
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C-10

BARRIER PERMEABILITY SUMMARY

The barrier permeabilities in the ORGDP cascade displayed decreasing trends in all buildings during the second quarter of fiscal year 1960. These decreases in permeability were greater than the experience for the preceding two year period in all buildings except the K-31 building. The cause of such a general decrease in barrier permeabilities throughout the entire cascade is not readily obvious. However, the measured barrier permeabilities in the ORGDP cascade were probably influenced to some degree by a general power redistribution within the process buildings, which was associated with the shut down of units K-305-10, -11, and -12 at the top of the K-25 building. This power redistribution was effected early in December; however, the magnitude of the barrier permeability decreases are greater than would normally be anticipated as a result of the changes in operating levels in the individual buildings. Outlined in table C-13 are the permeability changes associated with the various barrier types within each building in the ORGDP cascade.

PURGE CASCADE OPERATIONS

Unit K-312-1 was operated as the cascade top purge facility, and unit K-311-1 was operated as the cascade side purge during the second quarter of fiscal year 1960. The purge facility in unit K-311-1 purged an average of 16,014 scf per day, while the rate in unit K-312-1 averaged 6,108 scf per day. The total purge rate during the quarter averaged 22,111 scf per day, a decrease of 5.3% below that of the preceding quarter. The average daily purge rates are presented in table C-14 for each month of fiscal year 1960 to date.

TABLE C-14
Cascade Purge Rates

<u>Month</u>	<u>Average Purge Rates, Scf per Day</u>		
	<u>Top Purge Facility</u>	<u>Side Purge Facility</u>	<u>Combined Purge Facilities</u>
July, 1959	6,046	17,589	23,635
August	6,034	17,661	23,695
September	6,239	16,429	22,668
October	6,041	15,169	21,210
November	6,115	16,992	23,107
December	6,168	15,880	22,048

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C-11

K-1451

MATERIAL USAGES

The consumption rates of auxiliary materials which are essential to the plant operation are tabulated in table C-15. The material usages are listed for the first and second quarters of fiscal year 1960, exclusive of the code AK and code BR lube oils, and the liquid coolant. These latter items are presented for the periods of June 16 through September 15, 1959, and September 16 through December 15, 1959. Significant usage variations are discussed briefly below.

LIQUID NITROGEN

The liquid nitrogen usage decreased for the second consecutive quarter. A 46.2% reduction was experienced in process demands with a 17.9% reduction in demand at the other ORGDP facilities.

CODE AK LUBE OIL

A substantial percentage decrease in code AK lube oil consumption was experienced during the quarter as the result of an indicated gain of 1,862 gallons in the K-304 and K-305 sections during the inventory period November 16 through December 15.

TRICHLORETHYLENE

Trichlorethylene consumption decreased for the second consecutive quarter as a result of decreased degreasing requirements during the report period.

CARBON DIOXIDE

Carbon dioxide usage varies in proportion to demands at the ORGDP electrical generating station for purging operations. This activity is reflected in the decreased consumption during the quarter.

HELIUM

Equipment modifications preparatory to the initiation of the _____ program scheduled for the third quarter of fiscal year 1960 are reflected in the increased helium consumption during the quarter.

MFL OIL

MFL oil usage continued to increase for the second consecutive quarter. The majority of the material ordered within the plant area during the report period was shipped to the K-33 and K-1401 buildings.

TABLE C-15
Total Plant Consumption of Auxiliary Materials

		Fiscal Year 1960				% Change	Monthly Rate of Usage for Past 12 Months
		Second Quarter		First Quarter			
		Total	Monthly Average	Total	Average		
Nitrogen (Gaseous)	Scf.	10,652,855	3,550,952	10,082,660	3,360,887	+ 5.7	3,428,550 ± 171,235
Nitrogen (Liquid)	Scf.	2,190,813	730,271	2,778,439	926,146	- 21.1	957,475 ± 99,640
Coolant B-37	Lb.	28,407	9,469	27,390	9,130	+ 3.7	8,921 ± 225
Freon-114	Lb.	135,382	45,127	139,153	46,384	- 2.7	23,870 ± 7,219
Fluorine Process Consumption	Lb.	48,823	16,274	48,312	16,104	+ 1.0	15,382 ± 504
Lube Oil, Code BR	Gal.	2,687	896	2,877	959	- 6.6	628 ± 107
Lube Oil, Code AK	Gal.	6,995	2,332	10,176	3,392	- 31.3	2,520 ± 333
Dry Ice	Lb.	300,000	100,000	310,800	103,600	- 3.5	118,333 ± 20,554
Trichlorethylene	Gal.	7,981	2,660	11,885	3,962	- 32.8	3,451 ± 701
Carbon Dioxide (Gas)	Lb.	5,550	1,850	24,750	8,250	- 77.8	6,408 ± 3,308
Helium	Scf.	58,776	19,592	42,660	14,220	+ 37.8	14,655 ± 4,196
MFL Oil	Lb.	856	285	577	192	+ 48.4	198 ± 72

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INDUSTRIAL RELATIONS

INTRODUCTION

This section contains information pertinent to the plant's Industrial Relations Program. This includes Safety and Radiation Control, Medical and Industrial Hygiene, Equipment Safety Inspection, Fire Prevention and Protection, Security and Plant Protection, Employee and Company-Union Relations, Wage and Salary Administration, Cafeteria, Employment, Insurance, Recreation, Training, and various Employee Service and Benefit Plans.

SAFETY

INJURY EXPERIENCE

The 2 major injuries experienced this period resulted in a frequency rate of 1.01 injuries per million employee-hours worked and a severity rate of 38 days lost or penalized per million employee-hours worked. The annual frequency rate decreased 57% to 1.13 which is the lowest annual frequency rate experienced by the plant, and the severity rate of 161 is approximately one-half the corresponding value of last year.

Statistics on disabling injuries are shown graphically in figure E-1. The contribution of various types of unsafe acts and conditions to the total annual injury experience is shown in figure E-2, and current injury rates are compared with those of other periods in table E-1.

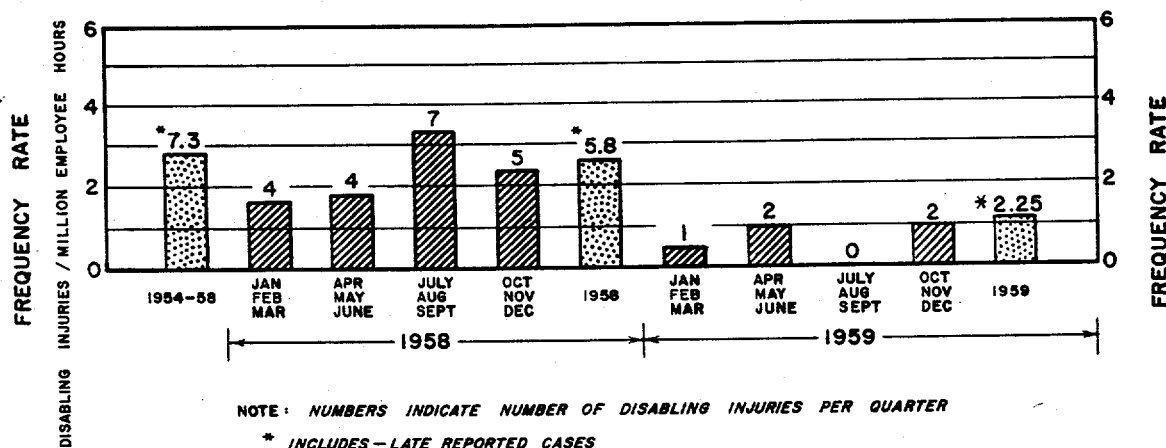


FIGURE E-1
Disabling Injury Frequency Rate

TABLE E-1
Injury Experience

	This Quarter	Last Quarter	1959 ^a	1958 ^a	1954-1958 ^a
Frequency Rate ^b (Disabling Injuries)	1.01	0.00	1.13	2.63	2.79
Severity Rate ^c	38	0	161	301	668
Frequency Rate ^b (All Injuries)	231	265	260	305	313
Disabling Injuries	2	0	2.3	5.8	7.3
Medical Treatment Cases	455	514	513	660	812
Total Injuries	457	514	516	666	820

^a Quarterly averages.

^b Number of injuries per million employee-hours worked.

^c Number of days lost or penalized per million employee-hours worked.

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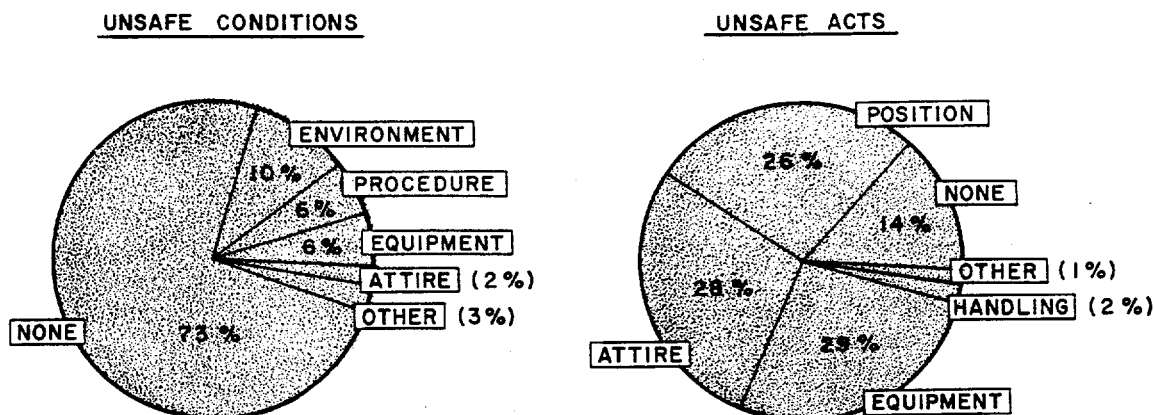


FIGURE E-2
Injury Causes

PROPERTY DAMAGE ACCIDENTS

The estimated damage loss of \$970 represents a considerable decrease from last period; however, the total loss of \$102,768 for the year was over 3 times that for 1958. Approximately 85% of the property loss this year resulted from a single incident in which high voltages developed in the electrical transmission system as a result of an electrical failure in an induced-draft-fan motor in the powerhouse. These high voltages precipitated additional electrical faults and fires in the associated primary and secondary busses and their switchgear. Accidents caused by prime and subcontractor personnel accounted for 12% of the total loss figure for the year.

Of 138 fires reported during the year, 60% involved the ignition of small amounts of debris during welding operations and were, for the most part, extinguished by Maintenance or Operations personnel using fire extinguishers which are kept readily available on such jobs.

As shown in table E-2, the number of motor vehicle accidents and the damage costs remained essentially unchanged from last year.

TABLE E-2
Accident and Loss Experience

		This Quarter	Last Quarter	1959 ^a	1958 ^a	1954-1958 ^a
Property Damage						
Fire	No.	27	30	35	47	14
	Damage	\$30	\$75	\$21,550	\$4,890	\$1,517
Motor Vehicle	No.	5	3	4.5	3.5	8.7
	Damage	\$400	\$440	\$668	\$695	\$764
Equipment	No.	3	4	5	2.5	4.5
	Damage	\$540	\$3,268	\$3,474	\$1,682	\$2,860
Total	No.	35	37	44	53	27
	Damage	\$970	\$3,783	\$25,692	\$7,267	\$5,141
Material Releases						
Toxic or Corrosive		2	4	4.5	5.3	3.3
		3	5	4.8	3.8	5.3
		0	1	0.5	0.25	0.3

^a Quarterly averages.

Current accident experience is compared with that of other periods in table E-2. Figure E-3 gives an annual comparison of accident losses and figure E-4 gives an annual comparison of the number of property damage accidents.

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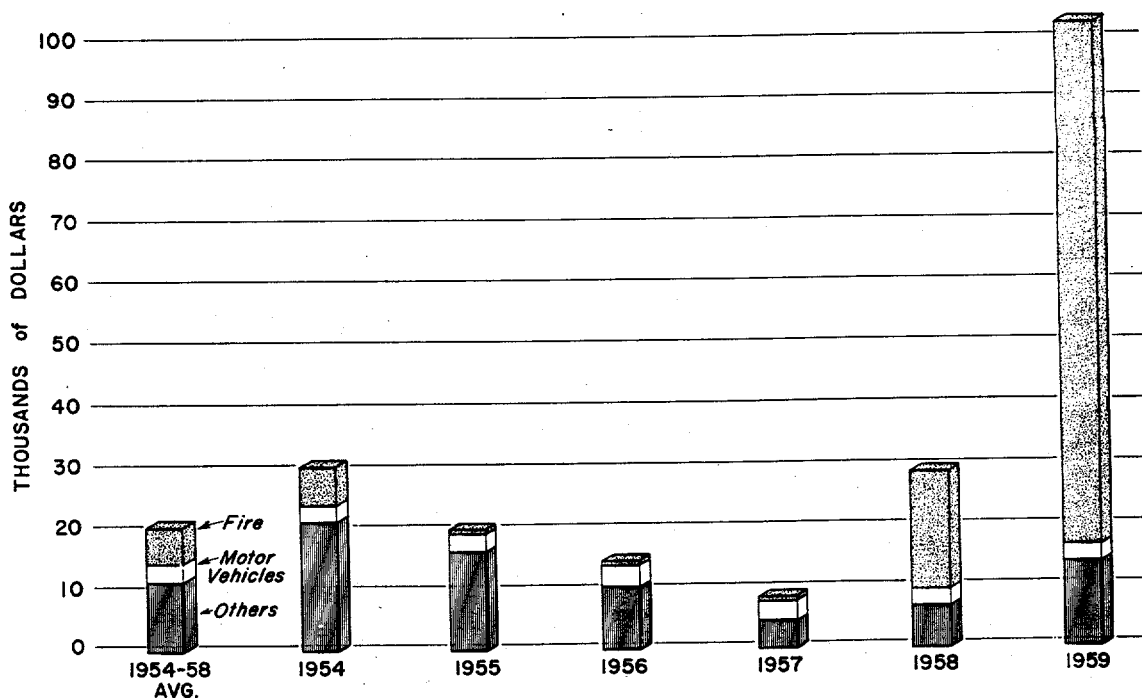
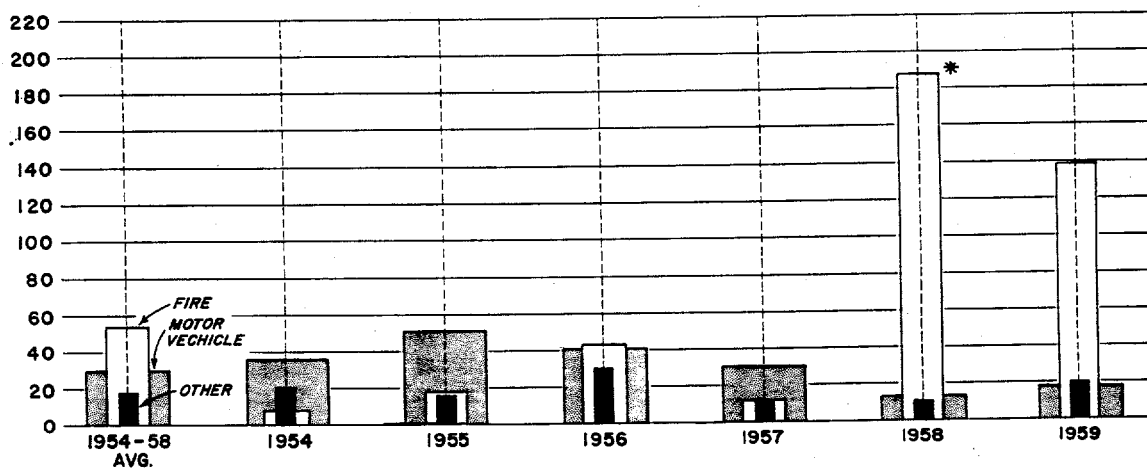


FIGURE E-3
Accident Loss



* PRIOR TO 1958 ONLY REPORTABLE FIRES, GENERALLY WITH A LOSS OF OVER \$ 50, WERE INCLUDED

FIGURE E-4
Number of Property Damage Accidents

OTHER INCIDENTS

Potentially Serious Incidents

A portable tar tank used by an AEC prime contractor exploded violently and the burning tar ignited the tank trailer and a pickup truck. Apparently, the heating tube, which is believed to have been only partly covered by the small amount of tar in the tank, became hot enough to vaporize the tar and then ignite the vapor-air mixture when it reached explosive concentrations. Although the 2 contractor employees involved received only minor injuries and there was no damage to plant

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property, slightly different circumstances may well have produced serious consequences.

Three separate incidents occurred during the year in which defective latches permitted vehicle doors to open during transit and employees fell and were injured, one of these having occurred this period. While none of these incidents resulted in serious injury, latches of other plant vehicles have been checked, and remedial action is being taken where necessary.

Material Releases

The 15 material releases occurring this year parallel the low experience of 1958. Of the 5 such incidents reported during this quarter, 3 involved radioactive material released when valves failed in the feed plant and in the cascade, and when a container of contaminated solution fell from a truck while in transit. The remaining 2 incidents involved fluorine releases at the feed plant due to equipment failure and maintenance operations. All incidents were quickly and effectively controlled.

ACCIDENT PREVENTION ACTIVITIES

Design and Specifications of Safety Significance

Routine review of design and specifications this quarter showed that adequate safety considerations were included in the proposed modifications of the K-1231 ^{Uranium} Oxide Pulverizing Facilities, the K-1420 Interim Polishing and Testing Facility, and K-1420 and K-1401 converter handling equipment. The design for replacement of the deteriorated butyl-lined hydrofluoric acid lines and for drip trays at the hydrofluoric acid vent condensers at K-1131 should significantly reduce the potential personnel exposure hazards from leaking systems, and the design of the low-level alarms for the K-1131 hydrogen production cells should minimize the potential explosion hazard of this area. Significant safety improvements were also included in the design and specifications for the relocation of propane storage tanks and for modifying the hydrofluoric acid storage area.

Safety Education and Promotion

Safety training programs for the year included filmed instructions as well as practice in the administration of mouth-to-mouth resuscitation. Routine safety emphasis was continued throughout the year through such media as safety meetings, use of automatic slide projectors to depict general safety subjects and to provide color slide displays of safety award items, pre-recorded telephonic messages covering the current safety record, safety billboard messages, and plant reports. In addition, safety items of general nature were routinely included in the Carbide Courier. A pamphlet covering the behavior of fires and appropriate individual and family escape plans designed to prevent victims from being accidentally trapped by residential fires was mailed to employees' homes.

The 1960 calendars which provide space for monthly posting of safety messages were issued, and safety awards were distributed to eligible employees in accord with the UCC Award Plan in recognition of 2 periods of injury-free employee-hours previously completed. Two hundred and ten safety meetings were held this period with 3,433 employees attending, this being comparable to meetings and attendance of preceding quarters. Safety meetings and attendance for 1959 and previous years are shown in table E-3.

Motor-Vehicle Operator Tests

Motor-vehicle operator test activities for 1959 and previous years are shown in table E-4.

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TABLE E-3
Safety Meetings and Attendance

	1959 ^a	1958 ^a	1954-1958 ^a
Meeting Reported	237	291	269
Attendance	4,081	4,867	4,591

^a Quarterly averages.

TABLE E-4
Motor-Vehicle Operator Tests

	1959 ^a	1958 ^a	1954-1958 ^a
No. Permits Issued	35	48	90
No. Tests Given ^b	9	67	28
No. Tests Qualifying	8	63	26
Per Cent Qualifying	84	93	93

^a Quarterly averages.

^b Includes tests of 3-wheel-vehicle operators holding valid operating permits.

PROTECTIVE EQUIPMENT

During the year, samples of chemical-resistant cloth were tested to determine their resistivity to hydrogen fluoride, chlorine trifluoride, and fluorine, and samples of gloves were tested for resistivity to alkalis, halogen gases, solvents, and acids. With the exception of protection against solvents and acids, polyvinyl-chloride-coated material was found to be the most effective.

Tests of a small number of M-11 canisters revealed that their effectiveness against hydrogen fluoride was not adversely affected by storage periods of up to 10 years.

Items of protective equipment adopted this year include the Thermalair respirator for use in hot environments, the Acme Spec mask equipped with holders for prescription lenses, acid hoods with built-in face piece, and face shields which permit the use of a standard respirator.

PLANT SAFETY EVALUATION

Safety audits of plant facilities and employee work practices indicated that both plant conditions and employee actions for the year remained essentially unchanged from last year with 95% of plant conditions and 93% of the employee work practices checked being satisfactory.

Current audit results are compared with those of other periods in table E-5.

TABLE E-5
Safety Audit Results

	This Quarter	Last Quarter	1959 ^a	1958 ^a	1955-1958 ^a
Plant Conditions					
Number Audited	7,189	8,402	7,938	8,586	10,944
Number Satisfactory	6,881	8,017	7,581	8,182	10,313
Per Cent Satisfactory	96	95	95	95	94
Employee Safe Practices					
Number Audited	858	1,155	1,032	984	1,394
Number Satisfactory	812	1,091	957	908	1,265
Per Cent Satisfactory	95	94	93	92	91

^a Quarterly averages.

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HEALTH PHYSICS

PERSONNEL MONITORING

Radiation Monitoring

The average film badge radiation exposure per person monitored increased from 108 to 116 mrem. This slight increase was apparently due to exposures to higher radiation fields by employees associated with feed manufacture. No personnel exposures exceeding the Plant Acceptable Limit were recorded.

The average exposure per person monitored is compared with corresponding figures for other periods in table E-6 and is shown graphically in figure E-5.

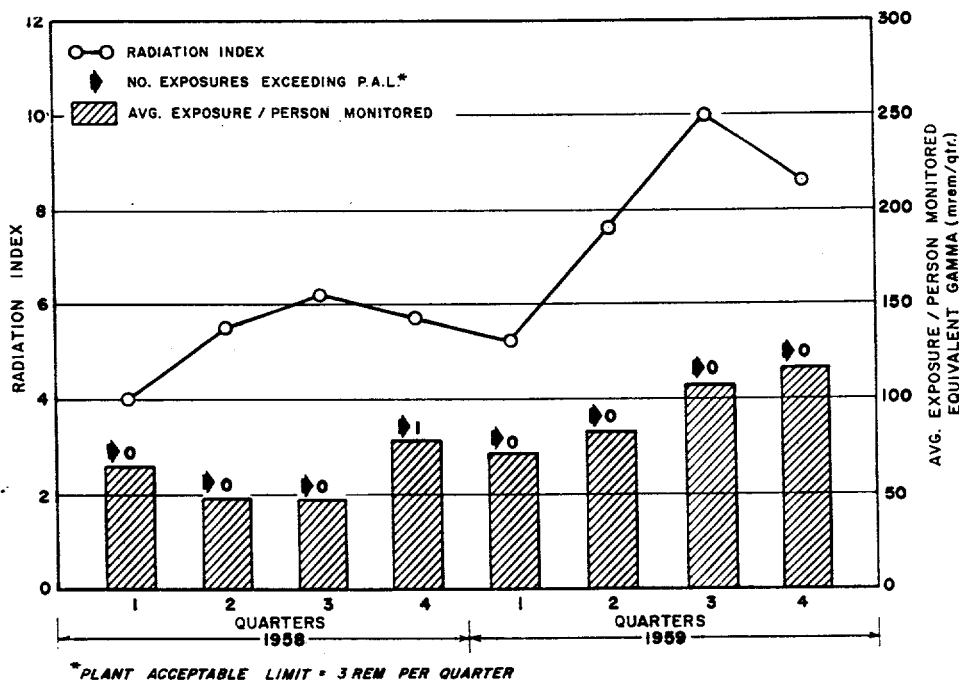


FIGURE E-5
Film Badge Exposure and Penetrating Radiation Index

Personnel Contamination

On-the-job spot checks of personnel who perform operations in contaminated locations showed improvement with only 9% of the 159 checks made this period exceeding the Plant Acceptable Limit. None of the 265 hand checks taken at the end of work periods was over the Plant Acceptable Limit. Results of these and other contamination checks are summarized in table E-6 and are shown graphically in figure E-6.

AIR-BORNE ALPHA ACTIVITY

Results of the routine shift-length air monitoring program for air-borne alpha activity showed an increase in both the number of samples exceeding the Plant Acceptable Limit and the average air activity. In the majority of instances, these conditions were noted in locations associated with feed manufacture and allied operations where the potential of high activity is recognized and the

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routine use of adequate respiratory protective devices is mandatory. An accelerated air-contamination evaluation program is in progress in these locations.

TABLE E-6
Personnel Radiation Monitoring

	This Quarter	Last Quarter	1959 ^a	1958 ^a	1954-1958 ^a
<u>Radiation Exposure</u>					
No. Persons Monitored	640	695	632	606	-
No. Exposures > P.A.L. ^b	0	0	0	0.25	0.13 ^c
Av. Equivalent γ Exposure Per Quarter					
Per Person Monitored (rem) ^d	0.116	0.108	0.096	0.059	-
Maximum Quarterly Exposure (rem)	2.90	1.52	2.90	3.65	4.01 ^c
<u>Routine Hand Checks</u>					
Av. No. Persons Checking Daily	265	263	293	353	474
Hand Checks > P.A.L.	0	0	0.5	0.25	4.7
<u>Personnel On-The-Job Spot Checks^e</u>					
Total Checks Made	159	168	180	191	421
No. > P.A.L.	15	26	26	22	86
Per Cent > P.A.L.	9.4	15	14	12	20

a Quarterly averages.

b Plant Acceptable Limit = 3 rems per quarter.

c 1955 through 1958 only.

d 0.6 rem of beta exposure is considered equivalent to 0.3 rem of gamma exposure.

e Includes checks of employees' hands and clothing.

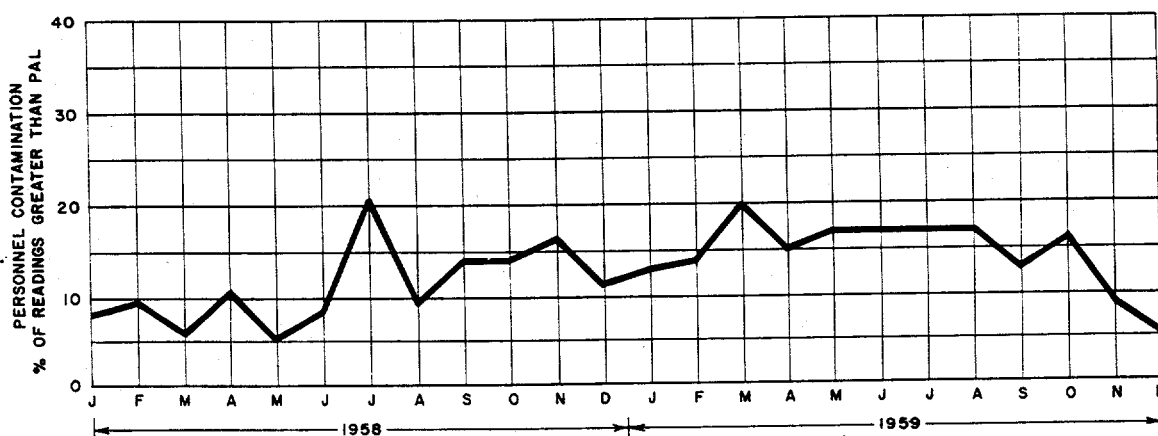


FIGURE E-6
Hand, Shoe, and Clothing On-The-Job Contamination

Spot air samples taken in conjunction with audit surveys also indicated an increase in air-borne activity as both the number of samples exceeding the Plant Acceptable Limit and the average air activity increased. The latter was primarily influenced by a single short-term peak which occurred during a sampling operation in K-601 involving the making and breaking of cylinder pigtail connections. In other plant locations, air activity levels remained unchanged and relatively low, with no new problems of significance.

Results of air-borne alpha activity samples are summarized in table E-7 and are shown graphically in figure E-7.

ALPHA CONTAMINATION

The plant alpha contamination level, as reflected by audit surveys of both operating and staff groups in the 28 plant locations where significant contamination is encountered, remained essentially

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unchanged from that of last quarter; however, the level for the year increased about 15% over the similar values for last year. This increase is attributed primarily to the spread of materials during normal operation and maintenance activities in the feed plant.

The results of routine audits are summarized in table E-7 and are shown graphically in figure E-8.

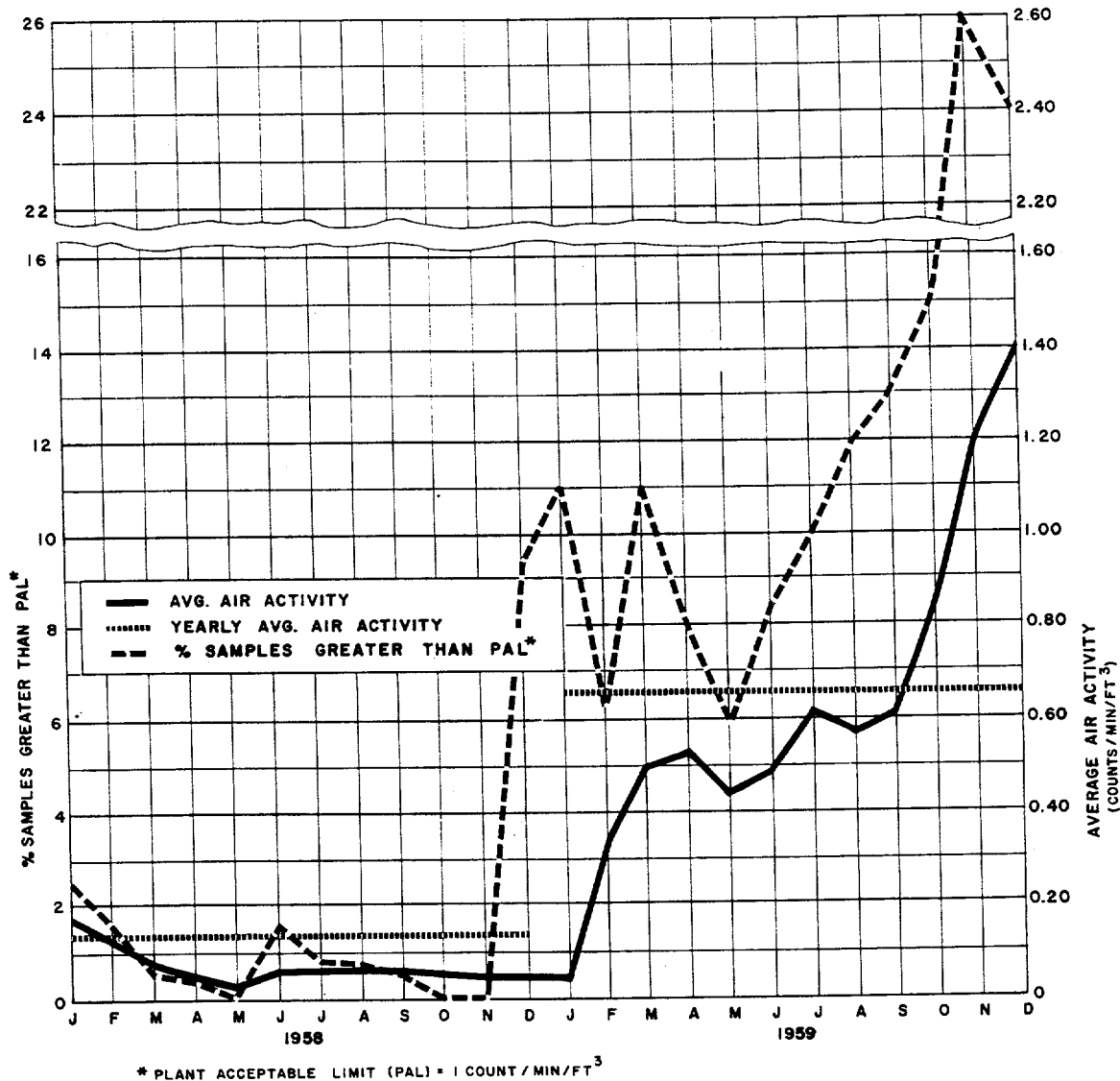


FIGURE E-7
Plant Air Activity and Shift-Length Air Samples

PENETRATING RADIATION LEVELS

The plant radiation index of 8.6 represents a slight decrease from last period, which was achieved primarily through more prompt clean-up of material spilled in the K-1131 pit area during equipment change-outs and through improved shielding of stored uranium ash containers. The radiation index of 7.8 for the year shows a continuation of the gradual upward trend in plant radiation levels as influenced by the feed plant and related activities where greater uranium conversion efficiency has resulted in increased concentrations of radiation-emitting ash materials.

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TABLE E-7
Environmental Radiation and Radioactive Materials

	This Quarter	Last Quarter	1959 ^a	1958 ^a	1954-1958 ^a
<u>Air Activity (Shift-Length)</u>					
No. Samples Taken	2,845	3,362	2,959	1,136	1,988
No. Above P.A.L. ^b	612	391	368	24	28
Av. Activity per Sample (c/min./ft ³)	1.1	0.59	0.66	0.13	0.13
<u>Air Activity (Spot)</u>					
No. Samples Taken	214	219	223	224	261
No. Above P.A.L. ^b	25	15	21	28	19
Av. Activity per Sample (c/min./ft ³)	11	0.57	3.3	0.96	0.88
<u>Alpha Contamination</u>					
Plant Contamination Index ^c	488	468	445	386	209
No. Locations Included	28	28	26	24	52
% Plant Area Surveyed	1.2	1.2	1.2	1.1	1.8
<u>Penetrating Radiation</u>					
Radiation Index ^d	8.6	10	7.8	5.4	3.0
No. Locations Included	8	8	8.5	9	9.3
<u>Plant Sanitary Water</u>					
Av. Gross Beta Activity (dis/min./100 ml.)	129	25	58	39	32
Av. Uranium Concentration (ppb.) in Sanitary Water Influent	3.1	1.1	2.0	2.4	-

a Quarterly averages.

b P.A.L. - Plant Acceptable Limit.

c The contamination index is a figure which reflects the product of the extent and intensity of alpha contamination exceeding the P.A.L. Values include those plant locations which a 6-month average contamination index of 10 or greater.

d The radiation index, which reflects both the extent and intensity of radiation found, is essentially the product of the work area over which the dose rate is more than 7.5 mrep/hr. and a weighting factor which depends upon the actual radiation intensities over the area concerned.

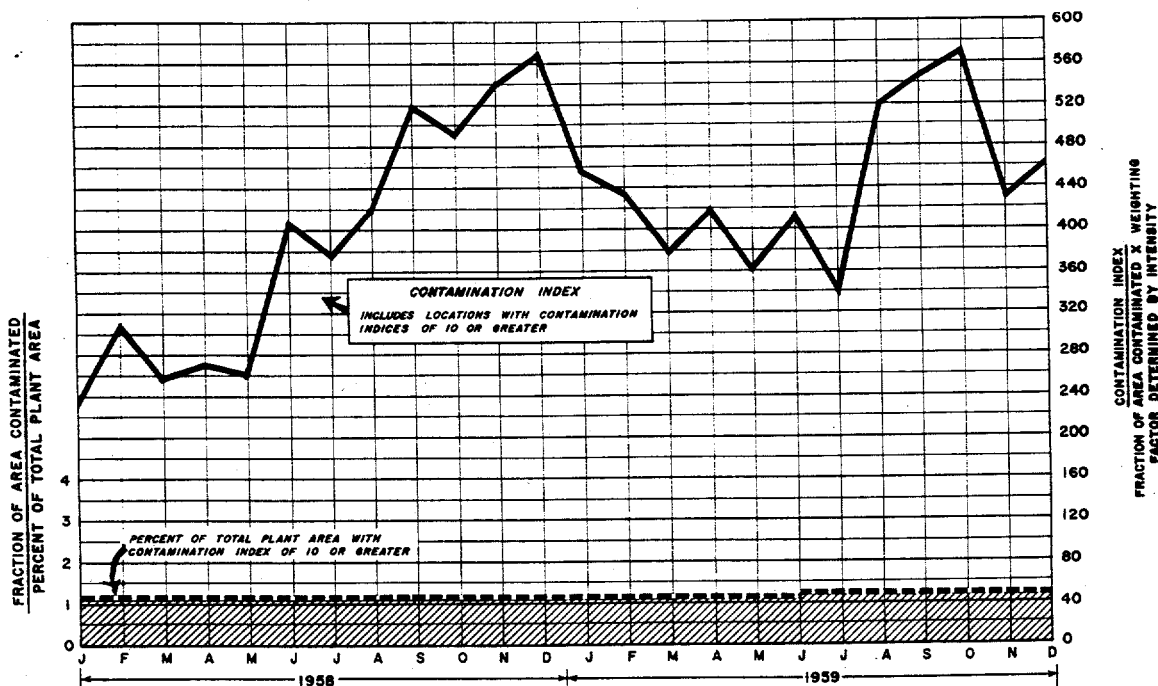


FIGURE E-8
Plant Contamination Levels

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RADIATION SOURCE CHECKS

Routine monthly checks of the 18 radium sources revealed no radium leakage. In addition, the annual inspection of other plant radiation sources, consisting of the various isotopes used in research, nondestructive testing, and instrumentation, revealed no leakage or violation of radiation safety requirements.

SANITARY WATER

Increased radioactive contaminants in the plant sanitary water supply noted over short intervals resulted in a quarterly average beta activity of 129 dis/min./100 ml., and the resulting yearly average was somewhat higher than that of last year. The increase, attributed to the discharge of mixed fission product waste materials from another upstream installation, presents no significant health consideration, and the activity values remain well below the appropriate NCRP MPC_w for 40-hour week occupational exposure to the mixture of radionuclides involved. Provision of a continuous detecting and recording low level beta water monitor in the sanitary water plant will afford more prompt indication of possible emergency conditions in the event of abnormally high concentrations of radioactive contaminants.

The average uranium concentrations in the plant sanitary water influent, as well as the average beta activity, are listed in table E-7 and shown graphically in figure E-9.

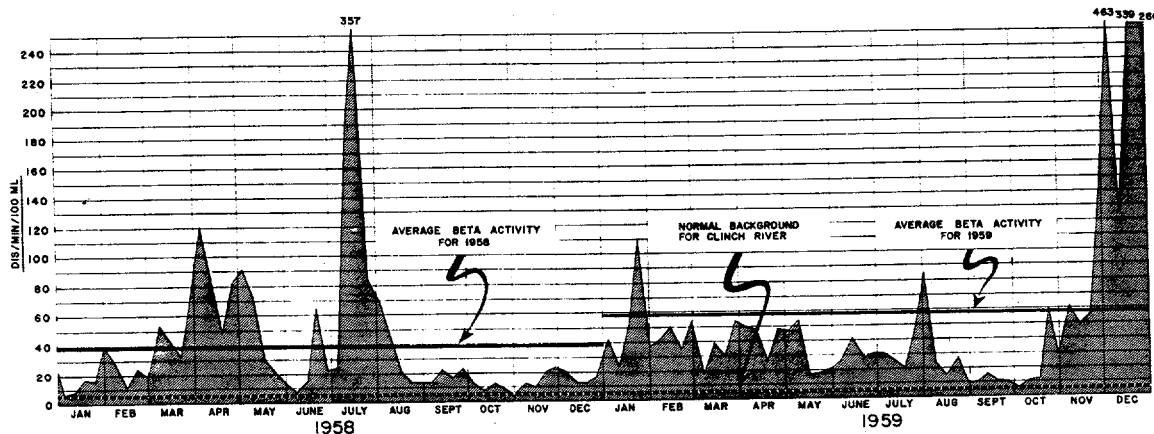


FIGURE E-9
Beta Activity in Plant Sanitary Water

PLANT ENVIRONS

The average uranium concentrations in the Poplar Creek and Clinch River increased this quarter, attributed to downstream movement of uranium-contaminated silt following a period of heavy rainfall. The quarterly and yearly average levels for these locations, as shown in table E-8, continue to remain well below concentrations which would indicate a health hazard or pollution problem.

SPECIAL STUDIES

A slight increase in contamination levels was noted in the K-1420 Recovery Area following recovery of uranium from Savannah River materials, but no unanticipated problems were involved.

Environmental sampling included studies of soil and vegetation which reflected normal distribution

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of uranium and fluorides, the levels being commensurate with air-borne activities in the same areas. Checks in local stagnant waters for strontium-90 attributed to bombtest fall-out revealed that levels have remained relatively low and unchanged in recent years.

TABLE E-8
Uranium Concentrations in Streams

<u>Stream Sampling Locations</u>	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959</u>	<u>1958</u>	<u>1954-1958</u>
Average uranium concentrations (ppb.) ^a in water at:					
East Fork at Poplar Creek	124	99	89	54	50
Poplar Creek at Clinch River	14	7.1	9.1	12	13
Clinch River 1 mile below ORGDP	4.3	1.9	3.8	4.1	3.6

^a 71,000 ppb. soluble natural uranium in water is equivalent to 5×10^{-5} μ c/ml., the Plant Acceptable Limit, based in NCRP MPC_w for effluents at points where they leave control of the plant.

SIGNIFICANT PLANT LOCATIONS OF HAZARDOUS MATERIAL

Figure E-10 shows the principal plant locations of some of the more hazardous materials and indicates the average extent and intensity of surface contamination by radioactive materials.

INSTRUMENTATION

Additions to plant radiation-detection equipment this year included 8 beta-gamma survey instruments, 1 fast-neutron instrument, 3 alpha survey instruments, six 200 mr dosimeters, and 1 dosimeter charger. New radiation alarms were installed in the K-1131 Feed Production Building, K-1231 Pulverizing Area, K-1410 Decontamination Building, and the K-601 Sampling Room.

Table E-9 lists radiation-detection instruments available in the plant. Audits of these instruments showed that about 87% were in satisfactory operating condition this year as compared with 83% in 1958.

TABLE E-9
Radiation-Detection Instruments

<u>Items</u>	<u>No. Available</u>
Constant Air Monitors	20
Air Samplers	34
Minometers	16
Dosimeters	60
Dosimeter Chargers	5
Beta-Gamma Survey Meters	214
Alpha Survey Meters	231
Hand Counters	45
Neutron Meters	1

NUCLEAR SAFETY

ACCIDENT PREVENTION ACTIVITIES

Engineering Design and Specifications

Nineteen approval letters concerning plant equipment and operations and 1 technical report were issued. Documents issued during the year included 49 approval letters, 1 uranium accumulation report, and 7 technical reports.

Criticality experiments with 2.0% enriched material in block and solution form were continued throughout the year at another UCNC installation and the data obtained, in conjunction with data from the Hanford PCTR experiments, with like material, enabled an increase in the plant criteria

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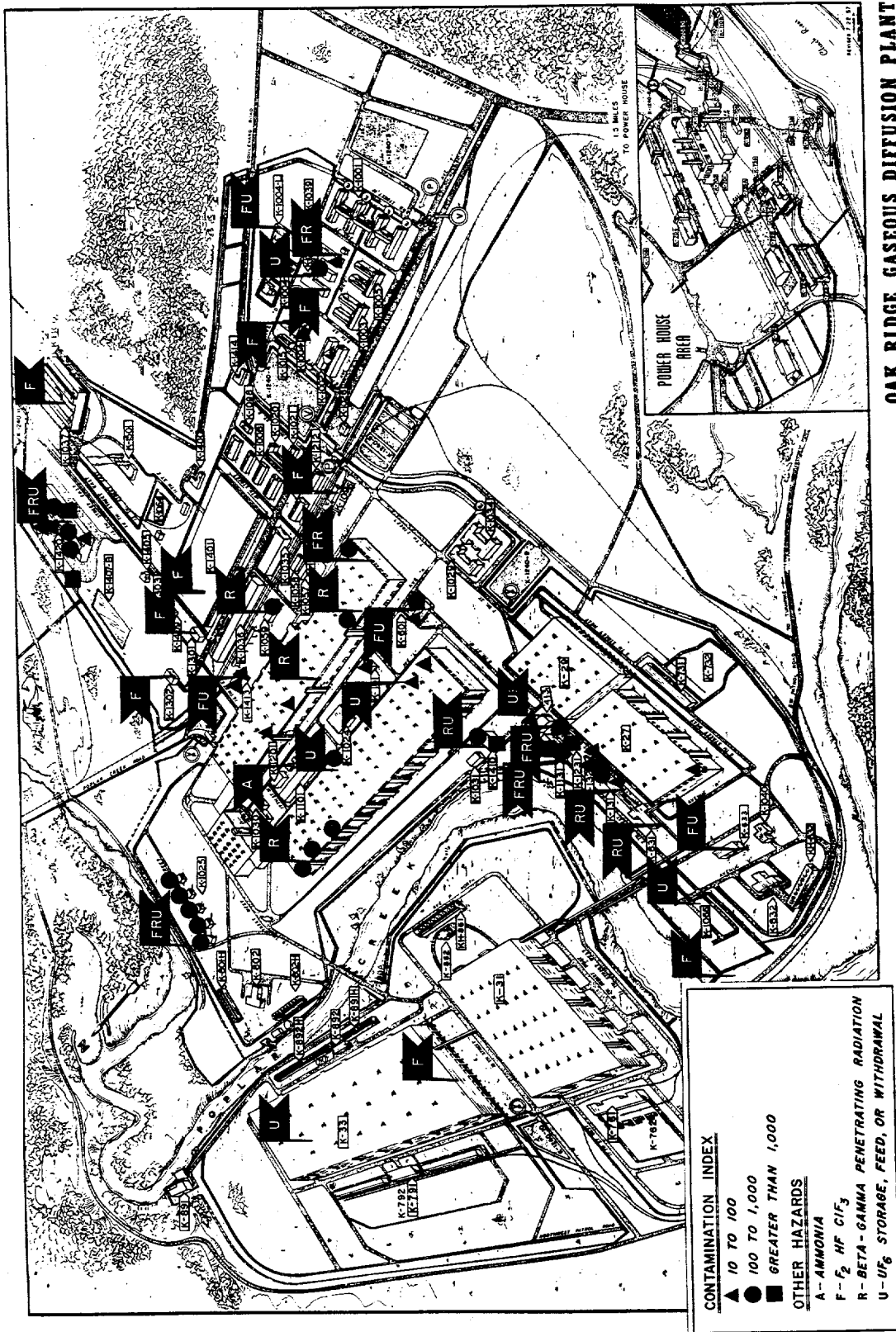


FIGURE E-10
Locations of Radioactive Contamination and Hazardous Materials

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for minimum critical enrichment from 0.71% to 0.90%. Additional highly enriched material data on the effect of neutron poisons resulted in the development of a new type of evaporator entrainment separator of nuclearly safe design. Theoretical studies were continued with respect to the further development of reactor codes of interest to the plant for the evaluation of cascade equipment.

EDUCATION AND PROMOTION

The United Kingdom film "Criticality," was widely shown to plant employees during the year. In addition, general information activities of the past quarter included the second nuclear training school sponsored by the AEC for personnel from the AEC and various facilities throughout the country concerned with handling of uranium materials; this was again conducted under the general supervision of plant personnel. Also held during the year was the first of a series of theoretical and experimental information exchange meetings between representatives of criticality groups in the Oak Ridge, Paducah, and Portsmouth plants.

PLANT EVALUATION

Two deviations from the provisions of approval letters were noted in field audits, and were immediately corrected. An unsuspected accumulation of low enrichment material, discovered in the K-1302 vent stack, was removed and processed in accord with safe practices. The total of 3 deviations and 2 accumulation incidents which occurred this year are in line with the low level of such occurrences for the past 4 years.

FIRE PROTECTION

PROTECTIVE EQUIPMENT AND FACILITIES

Final acceptance of the Proprietary and Supervisory Alarm System installed under Phase "A" of the Major Fire Protection Improvement Program was made this quarter, thus adding 213 waterflow transmitters, 49 supervisory transmitters, 3 alarm receiver-repeater panels, and a 6-circuit headquarters control panel to fire alarm equipment. Other new fixed fire protection facilities completed during the year include 223 sprinkler systems, 3 automatic CO₂ systems, 3 fire pumps, one 400,000-gallon elevated tank, and 20,700 feet of underground fire mains with associated valves and hydrants.

A total of 15 accidental water releases from new sprinkler system installations and 9 ruptures of underground fire water distribution mains, 7 of which were in new installations, occurred during the year. Ten of the water releases were due to defective sprinkler heads, 3 were due to ambient temperatures in excess of the sprinkler head rating, and 2 resulted from pipe breakage. It is believed that all instances of burst underground piping were caused by the increased pressure from the new fire water tank.

The efficiency of operation of fixed fire protection equipment in plant service, as shown in table E-10, indicate no significant changes during the past 2-year period.

FIRE PREVENTION ACTIVITIES

Fire and explosion protection safeguards incorporated in the design of the K-1301 Nitrogen Generation Facility included filtering devices and reactors for the removal of acetylene and other hydrocarbons. Similarly, adequate fire protection measures were included in the design for a new UF₆ to UO₃ conversion system involving the burning of hydrogen in the presence of oxygen in the K-1413 Development Laboratory.

Fire safety was improved by the removal of several banks of obsolete wood frame paper-type Edgewood

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Arsenal filters from the ventilation system of K-1004-J, and the extension of sprinkler coverage to include the remainder of the K-1024 Instrument Building. Other improvements to plant facilities this period included extension of explosion-relief vents from the three K-1100 gas cracker units to the exterior of the building

The exclusion of flammable adhesive and finish wrappings from the list of permissive materials to be used by the contractor in the new Central Data Processing Facility improved the fire preventive features of the insulating materials specified.

Of the 296 employees receiving training in the emergency use of fire fighting equipment this period, 106 were trained in the use of fire extinguishers, 119 in the use of hose streams, and 71 in the use of protective devices and equipment.

TABLE E-10
Operating Efficiencies of Fixed Fire Protection Systems

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1955-1958^a</u>
<u>Fire Alarm Systems</u>					
Total No. Alarm Devices ^b	827	632	683	614	609
Alarm-Hours Outage ^c	8	149	58	495	790
Operating Efficiency, Per Cent	99.99	99.99	99.99	99.96	99.94
<u>Sprinkler Systems</u>					
Total No. Systems ^b	272	232	156	48	45
System-Hours Outage ^c	327	209	210	67	79
Operating Efficiency, Per Cent	99.95	99.98	99.92	99.94	99.92
<u>Fire Water System</u>					
Total No. Hydrants ^b	236	236	234	230	232
Hydrant-Hours Outage ^c	742	647	609	453	303
Operating Efficiency, Per Cent	99.86	99.87	99.88	99.91	99.94

a Quarterly averages.

b Number in service at end of periods noted.

c Outage given in unit hours. For example, a hydrant out of service for 1 hour is 1 hydrant-hour outage.

PLANT FIRE PROTECTION EVALUATION

With the exception of a single major loss incident occurring in January and accounting for about 99% of the fire loss incurred this year, fire-loss experience, previously discussed, continues to be low and fire-prevention practices are generally satisfactory. The routine semi-annual inspections of fire-extinguishing units during the year continue to show that these units are generally in satisfactory condition; those found defective were immediately repaired or replaced. In addition, audits of plant facilities with respect to all types of fire hazards and fire-extinguishing appliances indicate no change from previous periods, with 98% of the items audited being satisfactory. Audit results are given in table E-11.

TABLE E-11
Fire Protection Audits

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1955-1958^a</u>
Number Audited	1,067	1,301	1,276	1,371	1,787
Number Satisfactory	1,048	1,275	1,252	1,338	1,703
Per Cent Satisfactory	98	98	98	98	95

a Quarterly averages.

ELECTRICAL SAFETY

ELECTRICAL SAFETY IMPROVEMENTS

Electrical safety improvements for the year included the installation of additional equipment grounds for the K-1401 Cleaning Area cranes, the installation of approved-type cord connectors and adequate

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equipment grounding for the K-1401 jib cranes, installation of explosion-proof electrical equipment in the K-1401 Paint Shop spray area, moving the crane conductors from the side to the less accessible center of the bays in the K-1401 Retubing Area, and the installation of enclosed feed rails for the K-33 pipe bay cranes.

ELECTRICAL SAFETY AUDITS

New Construction and Alterations

Audits of electrical installations associated with new facilities and major alterations to existing facilities indicated general compliance with specifications and code requirements. Approximately 95% of the items checked this period and 96% of all items checked this year were satisfactory as compared with 97% for last year. Audit results are summarized in table E-12.

Existing Installations

Audit results of plant electrical circuits and equipment during the year remained essentially unchanged from that of last year with 94% of the items checked this period and 93% of all items checked this year being satisfactory. Audit results are summarized in table E-12.

TABLE E-12
Electrical Safety Audits

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
<u>Construction and Alterations</u>					
No. of Items Checked	281	302	331	375	453
No. of Items Satisfactory	268	290	319	363	426
Per Cent Satisfactory	95	96	96	97	94
<u>Existing Installations</u>					
Number Audited	5,110	6,009	5,858	5,876	6,537
Number Satisfactory	4,800	5,588	5,461	5,469	6,076
Per Cent Satisfactory	94	93	93	93	93

a Quarterly averages.

EMERGENCY ACTIVITIES

EMERGENCY DRILLS AND RESPONSES

Activities for 1959 included 103 local and 6 plant-wide drills designed to acquaint employees with potential emergency problems. The emergency drills included simulated critical excursions, fires and explosions, rescue and first aid, operational failures, plant evacuations, and the release of toxic or corrosive materials.

Emergency drill activities are shown in table E-13 and emergency responses are shown in table E-14.

TABLE E-13
Emergency Drills Conducted in 1959

<u>Type of Drill</u>	<u>Number</u>
Fires and Explosions	54
Material Releases	15
Rescue and First Aid	28
Operational Failures	3
Plant Evacuation	1
Critical Excursions and Radiation	7
Civil Defense Alert (AEC)	1
TOTAL	109

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TABLE E-14
Emergency Equipment Responses

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
<u>Fire-Fighting Equipment</u>					
Alarms	15	20	23	43	42
Drills	15	21	21	27	40
<u>Emergency Truck</u>					
Alarms	10	15	17	32	31
Drills	19	25	22	29	37
<u>Ambulance</u>					
Alarms	9	13	12	13	14
Drills	9	8	8	12	16

^a Quarterly averages.

EMERGENCY TRAINING

Of the 1,052 employees receiving emergency training during the year, 543 were trained in the use of fire-extinguishing equipment, 307 in the use of protective devices and equipment, and 202 in the use of radiation-detection instruments. A special phase of training in radiation protection included the instruction of personnel having emergency responsibilities in the use of radiation-detection instruments in the relatively high radiation fields emitting from a 100-curie cobalt source in order to acquaint them with the radiation beam characteristics which may be encountered in operating areas.

MECHANICAL SAFETY

MECHANICAL SAFETY IMPROVEMENTS

Five cranes in K-31 were upgraded from 10 to 13 tons to accommodate process equipment of increased size and weight.

MECHANICAL INSPECTIONS AND TESTS

Routine inspections and tests showed boilers, unfired pressure vessels, diesel engines, steam turbines, compressed gas cylinders, and hoisting equipment to be in generally safe condition as was experienced in previous quarters. An improvement was shown in the per cent of pressure relief devices found in satisfactory condition. This was primarily due to replacement of relief valves on the water side of process building heat exchangers with lock-open gate valves which discharge into the cooling-water return system. The open passage to the cooling-water return system provides positive relief protection for the heat exchanger and the continuous water flow eliminates sediment plugging previously experienced with the relief valves.

A summary of routine inspections and tests is shown in table E-15.

WELDER QUALIFICATION TESTS

Weld tests for plant and subcontractor welders are summarized in table E-16.

SECURITY

SECURITY EVALUATIONS AND PRACTICES

An alleged theft of hand tools and welding equipment reported to the FBI failed to reveal factual evidence of the alleged theft. Routine checks at plant exits during shift changes disclosed 2 instances of attempted removal of Government property; the property value in each instance was

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trivial. Appropriate disciplinary and corrective actions were taken.

A self-entry system was instigated for the powerhouse area, which permitted removal of plant guards from the powerhouse portal. However, regular audits of plant protection and security interests will continue to be performed.

TABLE E-15
Mechanical Inspections and Tests

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1956-1959^a</u>
<u>Pressure Relieving Devices</u>					
Number Tested, Repaired, or Replaced	640	682	749	612	773
Number Satisfactory ^b	606	442	497	303	419
Per Cent Satisfactory	94.7	65.2	66.4	49.6	54.2
<u>Boilers and Pressure Vessels</u>					
Number Inspected or Tested	475	222	328	583	600
Number Satisfactory ^c	474	218	326	579	573
Per Cent Satisfactory	99.8	98.2	99.4	99.3	95.5
<u>Hoisting Equipment</u>					
Number Inspected or Tested	716	705	686	704	590
Number Satisfactory ^c	635	641	616	606	515
Per Cent Satisfactory	88.7	90.9	89.8	86.1	87.3
<u>Compressed Gas and UF₆ Cylinders</u>					
Number Tested	254	52	168	361	299
Number Satisfactory	254	52	158	356	295
Per Cent Satisfactory	100.0	100.0	94.0	98.8	98.7

a Quarterly averages.

b Devices requiring no cleaning, repair, or parts replacement.

c Includes equipment with minor defects, not affecting safe operation.

TABLE E-16
Welder Qualification Tests

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1956-1959^a</u>
<u>ORGDP Welders</u>					
Number Tests Given	14	29	14	29	56
Number Tests Satisfactory	13	27	12	27	45
Per Cent Satisfactory	92.9	93.1	85.7	91.4	80.4
<u>Subcontractor Welders</u>					
Number Tests Given	4	10	7	23	14
Number Tests Satisfactory	3	7	4	17	10
Per Cent Satisfactory	75.0	70.0	57.1	75.8	71.4

a Quarterly averages.

SECURITY AUDITS

In connection with establishing facility clearances, security surveys were conducted on the premises of Landers, Plume and Atwood, Thomaston, Connecticut; American Steel and Wire Division, U.S. Steel Corporation, Worcester, Massachusetts;

Audits of shipments of tube sheets from Fairbanks, Morse & Company showed no security violations.

Classified documents received and originated by the International Nickel Company in connection with a classified contract were reviewed.

Plant-wide audits showed that many employees were not displaying their security badges properly while within the plant area. Corrective action has been instigated and periodic rechecks are planned.

An audit of a shipment of reduced metal from Metals Disintegrating, Inc., disclosed that the content

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of the drums, which should not have been disclosed, was shown on decals. A subsequent audit disclosed that the vendor had included a drum of bronze powder for a Knoxville business concern. Investigation showed no evidence that security had been compromised and corrective action was taken to prevent a recurrence.

Routine audits of construction and storage areas and salvage yards showed no security violations. Routine audits showed 99.98% of the Top Secret repositories and 99.84% of the Secret and Confidential repositories were closed and locked when unattended, this being in line with previous experience.

SECURITY CLEARANCES

Personnel Clearances

Security clearances were obtained for 22 prospective employees and 12 clearance requests are pending. Similarly, 363 clearances were obtained for subcontractor and vendor personnel, with 43 requests pending.

Facility Clearances

Facility clearances were obtained for 9 companies in connection with bidding and purchasing activities.

Facility clearances which 4 companies no longer needed were withdrawn.

SECURITY EDUCATION

In addition to security education routinely given through staff meetings and line supervision, security reminders were included in the Carbide Courier and a security education bulletin entitled "Espionage" was distributed to each employee through line organization. This bulletin was also sent to vendors having classified contracts and to all construction subcontractors.

INDUSTRIAL HYGIENE

BIO-ASSAY RESULTS

During industrial health and associated recall examinations, 1,573 chemical urinalyses were made. None of the 481 values which indicated urinary contaminants equal to or greater than plant control values were clinically significant. The increase of these values from 24.5% to 30.5% of those done reflects predominantly the level of maintenance activity in the feed, cascade, decontamination, and pilot plant buildings. Chemical urinalyses results are summarized in table E-17.

INDUSTRIAL ENVIROMENT

Air-borne Contaminants

The analyses of air samples taken in plant work areas for uranium and other chemically toxic materials are summarized in table E-18.

Heat Studies

The utilization of radiant heat shields around an entire K-29 cell, plus maximum use of the building cooling-air system, was found to decrease the enviromental heat conditions sufficiently to permit

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employees to work in the inclosed area for an entire shift without excessive heat exposure.

TABLE E-17
Chemical Urinalyses

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Alpha Activity					
No. Analyses	1,465	1,302	1,465	1,578	1,574
No. Positive Results ^b	127	83	107	117	71
Fluorides					
No. Analyses	1,234	1,018	1,170	1,373	1,251
No. Positive Results ^b	14	3	7	29	50
Lead					
No. Analyses	17	15	12	14	9
No. Positive Results ^b	0	0	0	4	< 1
Mercury					
No. Analyses	182	148	167	158	166
No. Positive Results ^b	0	0	2	1	3
Plutonium					
No. Analyses	4	4	6	5	29
No. Positive Results ^b	0	0	0	0	< 1
Uranium					
No. Analyses	1,473	1,311	1,470	1,589	1,608
No. Positive Results ^b	340	250	292	219	244
Trichloroacetic Acid					
No. Analyses	21	9	12	0	< 1
No. Positive Results ^b	0	0	0	0	0
Copper					
No. Analyses ^c	0	0	< 1	0	0
Nickel					
No. Analyses ^c	52	26	44	78	78 ^d

a Quarterly averages.

b Positive results are those equal to or greater than plant control values.

c No established M.A.C.

d 1957-1958 only.

TABLE E-18
Air Samples

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Uranium					
No. Samples	909	790	942	807	613
No. Significant Findings	164	142	136	127	64
Miscellaneous					
No. Samples	1,616	1,630	1,686	1,483	1,246
No. Significant Findings	169	102	98	108	151

a Quarterly averages.

PLANT ENVIRONS

An enviromental survey made of the proposed compressor test stand location in the K-1303 building indicated that the previous use of this building would present no health hazards.

An audit during recovery of Savannah River materials in the K-1420 building indicated that this process would not significantly influence the normal nitrogen dioxide and uranium levels or the results of chemical urinalyses of specimens submitted by employees in this area.

The exhaust of the electrolytic-stripping tanks in the K-1098-E building has been improved and is now adequate. The increase in electrolytic plating in this area created an entrainment problem which was corrected by placing a cover on the tank.

The results of air samples taken as part of the air-pollution survey program, summarized in table

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E-19, continue to indicate that atmospheric fluoride concentrations may be sufficiently high to produce marking on the more susceptible foliage in the immediate plant area. However, fluoride in all samples, as well as other materials for which samples were analyzed, were well below the maximum allowable concentration for industrial human exposure.

TABLE E-19
Air-Pollution Survey Summary

<u>Contaminant</u>	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>
Chlorides				
No. of Samples	4	0	2	12
Average Conc. ppm. Cl ₂	0.4		0.8	1.58
Highest Conc. ppm. Cl ₂	0.7		3.9	14.60
Lowest Conc. ppm. Cl ₂	0.2		0.2	0.01
Fluorides				
No. of Samples	90	108	101	105
Average Conc. ppb. HF	5.6	6.0	6.6	8.7
Highest Conc. ppb. HF	19.8	48.1	48.1	55.0
Lowest Conc. ppb. HF	0.5	0.0	0.0	0.2
Nitrogen Dioxide				
No. of Samples	0	0	34 ^b	0
Average Conc. ppm. NO ₂			0.17	
Highest Conc. ppm. NO ₂			1.70	
Lowest Conc. ppm. NO ₂			0.02	
Sulfur Dioxide				
No. of Samples	264	264	270	288
Average Conc. ppm. SO ₂	0.03	0.03	0.04	0.05
Highest Conc. ppm. SO ₂	0.16	0.19	0.26	0.87
Lowest Conc. ppm. SO ₂	0.00	0.00	0.00	0.01
Uranium				
No. of Samples	10	12	11	11
Average Conc. µg./m ³ U	0.5	0.3	0.6	0.7
Highest Conc. µg./m ³ U	1.6	1.1	2.5	3.0
Lowest Conc. µg./m ³ U	0.1	0.1	0.1	< 0.1

^a Sample numbers listed are quarterly averages.

^b One series of samples representing 7 days.

MEDICAL ACTIVITIES

There were no changes in the basic medical facilities and services. The medical case load is given in table E-20.

EMPLOYEE AND COMPANY-UNION RELATIONS

COMPANY-UNION NEGOTIATIONS

Pursuant to wage re-opener provisions in both the AFL-CIO and UPGWA union contracts, renegotiation of wage schedules resulted in an increase of 9 cents per hour across-the-board except rates of Cafeteria workers were not increased. Stipulations were also signed with both unions relating to an improved Vacation Plan which grants 4 weeks' vacation after 20 years Company Service.

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TABLE E-20
Medical Case Load

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Industrial Injuries and Illnesses	2,185	2,273	2,328	2,994	3,336
Nonindustrial Injuries and Illnesses	4,403	4,263	4,276	5,076	5,677
Pre-employment and Rehire Examinations	30	55	53	52	122
Terminations	52	110	75	204	162
Periodic Examinations	418	461	563	510	481
Interim Examinations	244	223	166	184	238
Industrial Health Examinations	1,270	1,125	1,232	1,360	1,408
Optometric Visits	737	961	826	796	943
Return to Work, Recall, and Miscellaneous	2,608	2,998	2,705	2,458	2,819
Total Case Load	11,947	12,469	12,224	13,634	15,186
Services to Outside Parties ^b	55	38	37	24	81
Laboratory Procedures Completed	9,265	9,907	10,413	11,273	11,861
Electrocardiograms	363	408	455	426	420
X-ray Examinations	1,621	2,172	1,885	2,048	2,443

a Quarterly averages.
b Included in case load.

EMPLOYEE - GRIEVANCES

Time spent by certified union representatives in investigating and processing grievances continued to decrease with 3.1% of their working time having been spent on grievances this quarter.

There were 25 grievances disposed of, all of which were in the AFL-CIO unit. The 4 grievances pending arbitration at the end of last quarter were withdrawn; however, 6 other grievances were appealed to arbitration and these were pending at the end of the quarter. Grievance settlements under the various steps of the grievance procedure are listed in table E-21.

TABLE E-21
Grievance Procedure Settlements

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
First Step	5	3	4	3	20
Second Step	8	9	11	13	15
Third Step	12	31	24	19	22
Arbitrated	0	5	2	4	2

a Quarterly averages.

DISCIPLINARY ACTIONS

Disciplinary actions are summarized in table E-22.

TABLE E-22
Disciplinary Actions

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Formal Reprimands	22	20	19	20	23
Suspensions	10	5	6	9	7
Discharges	2	1	1	1	2

a Quarterly averages.

PERSONNEL STATISTICS

Statistics pertaining to the work force are given in table E-23 and those pertaining to absenteeism and labor turnover are given in table E-24.

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TABLE E-23
Force Report

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Type of Personnel					
Production Operations	1100	1119	1133	1263	1478
Maintenance	1419	1428	1436	1613	2094
Laboratory Research	467	466	467	467	544
Staff Services and Others	1156	1176	1170	1183	1290
Total	4142	4189	4206	4526	5406
Type of Payroll					
Hourly	2116	2150	2162	2415	3095
Weekly	955	955	963	985	1141
Monthly	1071	1084	1081	1126	1170
Sex					
Males	3572	3616	3632	3952	4745
Females	570	573	574	574	661

a Quarterly averages.

TABLE E-24
Absentee Rate and Labor Turnover

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Absentee Rate, Per Cent	3.00	3.20	3.16	3.32	3.30
Labor Turnover, Per Cent	1.44	2.56	1.92	4.86	3.03
Reason for Termination					
Resigned	29	78	41	47	70
Layoffs (Reduction in Force)	19	18	26	130	73
Discharged	1	1	1	1	2
Deceased	3	0	3	6	4
Retired	4	8	5	4	4
Military Induction	0	1	1	3	6
Transfers	9	4	12	29	23
Disabilities	4	2	4	3	3
Total	69	112	93	223	185
Rehires and Reinstatements	7	15	16	20	34
New Hires	15	39	27	19	57
Transfers	0	2	1	3	1
Total	22	56	44	42	92

a Quarterly averages.

EMPLOYEE BENEFIT PLANS

Payments to employees under benefit plans for which the entire cost is borne directly by the Company are shown in table E-25, and costs to the Company and payments to employees under plans for which the Company bears a part of the cost are shown in table E-26. The per cent of employees participating in each of the voluntary plans is shown in table E-27.

TABLE E-25
Benefit Plan Payments by the Company to Employees

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Lay-off Allowance	\$ 15,076	\$ 15,074	\$ 17,647	\$ 48,685	\$ 20,332
Jury Duty	7,423	4,339	6,901	5,737	4,520
Occupational Disability Make-up Pay	5,099	4,251	3,955	7,951	6,422
Sick Pay, Non-occupational	126,319	122,597	122,838	131,235	117,699
Military Policy	3,109	13,056	5,394	5,545	5,362
Vacation Plan	348,364	535,217	349,749	385,523	308,561

a Quarterly averages.

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TABLE E-26
Benefit Plans Provided Through Contributions and Premiums

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
<u>Cost to Company</u>					
Group Insurance Plan	\$ 94,931	\$ 99,481	\$ 97,347	\$105,496	\$106,118
Hospital and Surgical Plan	61,190	54,542	97,363	57,122	57,778
Workmen's Compensation Insurance	19,930	20,009	20,206	23,795	21,744 ^b
Savings Plan	139,916	139,738	140,092	141,525	140,894
Retirement Plan	212,813	237,432	238,876	216,527	172,998
Major Medical Insurance	None	None	None	None	None
<u>Payments to Employees</u>					
Group Insurance Plan:					
Health and Accident	51,497	55,379	55,050	61,847	63,059
Death Payments	24,625	11,000	43,281	46,250	44,200
Total and Permanent Disability	58,000	60,000	57,940	49,750	33,250
Workmen's Compensation Insurance	1,957	1,719	1,554	3,239	3,100
Major Medical Insurance ^c	4,083	9,795	9,071	11,891	5,567 ^d
Savings Plan			Payable every two years		
Retirement Plan			Payable on retirement		
Hospital and Surgical Plan			Due to contract change to Blue Cross, actual figures not available.		

a Quarterly averages.

b Not available prior to 1956.

c Prudential only, amount of Blue Cross payments not available.

d Plan not in effect prior to 1955.

TABLE E-27
Per Cent of Employees Participating in Benefit Plans

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Group Insurance Plan	98.5	98.0	98.4	98.8	97.1
Hospital and Surgical Plan	99.4	97.2	98.3	98.6	97.7
Savings Plan	93.8	93.4	93.4	93.0	91.2
Retirement Plan	55.0	53.8	53.6	50.1	39.2
Major Medical Insurance ^b	94.2	94.2	94.4	83.8	82.0

a Quarterly averages.

b Based on eligible personnel.

INDUSTRIAL RELATIONS SERVICES

CAFETERIA AND CANTEENS

Statistics relative to the operation of the Cafeteria and canteens are given in table E-28.

TABLE E-28
Cafeteria and Canteen Statistics

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>FY-59</u>	<u>FY-58</u>
Total Costs	\$ 68,296.00	\$ 68,446.00	\$288,018.00	\$370,127.00
Total Sales	69,892.00	71,448.00	287,963.00	364,613.00
Net Gain	1,596.00	3,002.00	-	-
Net Loss	-	-	55.00	5,514.00
Average Sale	.2916	.2924	.2795	.2458
Average Cost Per \$100 Sales	97.7164	95.7983	100.0190	101.5123
Average Monthly Cost Per Employee	.1279 ^a	.2374 ^a	.0010	.0915
Customer Count	239,658	244,288	1,030,446	1,483,543
Per Cent of Sales:				
Cafeteria	43.19	42.70	41.58	34.51
Canteens	53.62	52.40	54.63	61.65
Vending Machines (Commission)	3.19	2.90	3.79	3.84

a Credit

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RECREATION

Seasonal plant-sponsored recreational activities included the Children's Christmas parties which were attended by 6,702 children and parents from the 3 Oak Ridge plants, 2,026 participating from this plant, and the Girls' Club Halloween and Christmas dances. The third 1959 Fishing Rodeo was concluded, and leagues of 10 basketball teams and 8 volleyball teams were organized. Participation in the various plant-sponsored recreational activities is summarized in the table E-29.

TABLE E-29
Participation in Recreational Activities

<u>Activity</u>	<u>Individual Participation</u>
Badminton League	12
Basketball League	45
Bingo Parties (3 Groups)	221
Bowling Leagues	648
Camera Club	25
Camera Contest	39
Children's Christmas Parties	2026
Dances (Halloween and Christmas)	450
Fishing Rodeo	95
Girls Club	41
Physical Fitness Class	30
Picnics (Bar-B-Q)	250
Pistol League	18
Rifle League	20
Table Tennis	15
Turkey Shoots (4 Groups)	215
Volleyball League	40
Total	4190

TRAINING

Clerical training was carried on this quarter and a reading improvement program of 18 sessions was concluded. Income tax assistance decreased significantly during 1959 as result of encouraging employees to prepare their own returns, especially since the tax forms were greatly simplified. Routine training activities and attendance to these activities are given in table E-30.

TABLE E-30
Training Activity Attendance

	<u>This Quarter</u>	<u>Last Quarter</u>	<u>1959^a</u>	<u>1958^a</u>	<u>1954-1958^a</u>
Aptitude Testing	25	10	12	68	76
Clerical	212	0	53	62	116
First Aid	0	21	85	139	146
Income Tax	5	1	68	396	491
Interviews	0	0	3	40	32
New Employee Orientation	15	50	38	30	78
Reading Improvement	554	0	234	834	279
Security	15	50	38	30	77
Supervisory Conferences	160	30	241	1630	853
Management Correspondence	0	0	163	197	49
Film Showings	795	676	373	126	234
Blueprint Reading	0	0	131	278	56

^a Quarterly averages.

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NUCLEAR MATERIAL CONTROL

INTRODUCTION

The nuclear material control program at the Oak Ridge Gaseous Diffusion Plant is concerned with maintaining accurate measurements of uranium inventories and flows. Efforts toward improving material measurements are made on a continuing basis.

GENERAL STUDIES ON MATERIAL CONTROL

PRODUCT CYLINDER SAMPLING TEST

A cylinder sampling test of a 5" cylinder containing 23,339 grams of Paducah tails material has been completed. The test was designed to check the validity of the cylinder sampling technique for 5" product type cylinders containing uranium hexafluoride.

The cylinder was heated until liquefied, then rocked to homogenize its contents. After homogenization, the cylinder was inverted, connected to a sampling manifold and three samples of approximately 105 grams each were withdrawn. The cylinder was then allowed to cool. After the cylinder had cooled, 301 grams of C-816 was charged to the cylinder. The cylinder was again heated to liquefy the cylinder contents and homogenization was accomplished by rocking. Five samples were withdrawn from the cylinder. The procedure was repeated until a total of 15 samples were obtained. Each sample was analyzed in duplicate (two P-10 tubes) by gravimetric analysis for uranium in the Works Laboratory.

The mean of the analyses of samples withdrawn prior to charging the cylinder with C-816 was 67.593% uranium. The mean of the analyses of the 15 samples obtained subsequent to the charging of C-816 to the cylinder was 66.707% uranium. The calculated theoretical weight percent uranium for the contents of the cylinder after the charging of C-816 was 66.718%. No significant difference between means was observed; therefore, adequate sampling by this technique exists.

Analysis of Feed Manufacture Material Flows

Presented in table G-1 is an analysis of ORGDP feed plant material throughputs for fiscal year 1959. This analysis was made to determine the accumulation points throughout the process system for the elements Technetium and Neptunium. The object of the study was to locate possible take off points for the recovery of these elements from the plant by-product streams. The chemical analyses for Neptunium and Technetium of the materials shown were made at the Oak Ridge National Laboratory from samples obtained by the Health Physics Department of the Oak Ridge Gaseous Diffusion Plant.

TABLE G-1
ORGDP Feed Plant Material Flow Analysis

Equipment Description	Pieces of Equipment	Material Processed	July 1, 1958 thru June 30, 1959 Analysis		Material Accumulated		Gen. Rate/Mo.	
			Tc - ppm	Np - ppb	Gms - Tc	Gms - Np	Gms - Tc	Gms - Np
F ₂ Tower Ash	4	6,449,149 gms	0.940 ppm	< 1	6.06	0.006	0.51	0.0005
F ₂ Clean-Up Reactor Ash	1	21,772,320 gms	0.630*ppm	3	13.72	0.065	1.14	0.0054
Barrier Filter	4	816,462 gms	3.800*ppm	3	3.10	0.002	0.26	0.0001
Cyclone Filter	2	5,896,670 gms	2.250*ppm	10.5	13.27	0.062	1.11	0.0052
K-1410 Soak Tank Solution	1	30,031 l.	1.900 mg/l.	3	57.06	0.000	4.76	0.0000
K-1410 Soak Tank Sludge	1	916,252 gms	1.400 ppm	< 1	1.28	0.001	0.11	0.0001
* Average analysis								

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Processing Savannah River Uranyl Nitrate Solution

During November 1959, the ORGDP received three tank trailers of uranyl nitrate (UNH) solution from Savannah River, which totaled 11,400 gallons of UNH solution (3800 gallons/trailer). An accountability procedure was written to outline the methods used for accountability in the processing of this material at the Oak Ridge Gaseous Diffusion Plant.*

The K-1215 truck weight scales were used as the official scales in weighing the tank trailers. These scales are graduated in ten pound (10 lb.) increments and have a capacity of 30 tons. The ORGDP receiving weight was established by weighing each tank trailer before and after processing. Therefore, it was necessary to inspect each trailer for foreign matter such as ice, snow, and mud adhering to the trailers, before they were weighed in. The inspection of each tank trailer revealed no deposits of foreign matter; therefore, no cleaning was necessary.

A sampling test was accomplished on the first tank trailer of material received in order to ascertain the degree of homogenization required for future tank trailer sampling. The test included sampling of the trailer as received, and at varying intervals of mixing. The mixing of the solution was accomplished by recycling the material from the dip-leg feed line of the trailer and returning to the open inspection port on the trailer through a nozzle equipped with an anti-splash cover. The solution was recycled by a pump capable of moving 1,800 gallons of solution per hour. All tank trailer samples were aspirator thief samples. Sampling of the feed line to the process equipment was made by the continuous sample method already established at the ORGDP. Each feed line was sampled by a continuous sample integrated with the material feed rate. The waste lines from the evaporators were sampled once each hour to control the condensate discard steam.

Sampling Test of SRO (UNH) Solution

The laboratory results of the sampling test were analyzed by the analysis of variance technique with the following results.

1. There was no significant difference in sampling due to agitation.
2. The sampling and analytical limits of error for uranium are $\pm 0.25\%$.
3. The uranium limit of error for each trailer is calculated to be 265 grams. For the difference between stations the LE is 375 grams uranium.

A summation of the Savannah River UNH receipts is shown in table G-2.

K-1302 Vent Stack Contamination

Following recent high uranium analyses on the K-1420 fluorination system vent line, the K-1302 vent stack was opened for inspection. This was done on October 14 after having been opened on September 28. Approximately two years ago, this stack was found contaminated and was cleaned. However, at that time some residual material was allowed to remain. During the current cleaning, all material was removed. The recovery amounted to 627 pounds of material containing 26,069 grams uranium and 853 grams uranium 235.

Referee Analysis of Belgian Oxide Samples

Four lots of Belgian oxide were observed to have uranium analyses as determined at the ORGDP and Ledoux laboratories outside the defined splitting limit of 0.1%. Referee samples from these

* Varian, A., and Stief, S. S., "Test Run of Savannah River UNH," January 20, 1960, KP-1815 (Secret).

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lots were forwarded, at the request of AEC, to the National Bureau of Standards for analysis. The results of these analyses are shown below:

Lot No.	% UO ₃		
	ORGDP	Ledoux	NBS
29	99.44	99.33	99.41
30	99.43	99.30	99.42
33	99.52	99.41	99.52
34	99.46	99.34	99.45

TABLE G-2
Summary of SRO (UNH) Measurements

Shipment No.	Gross Weight (Lbs.)			Analysis gU/g			Uranium Kg		
	SRO	ORGDP	Difference*	SRO	ORGDP	Difference*	SRO	ORGDP	Difference*
75	32,630	32,600	30	.004847	.004833	.000014	71.739	71.421	0.318
76	31,960	32,580	-620	.004872	.004857	.000015	70.625	71.821	-1.196
77	32,720	32,670	50	.004872	.004862	.000010	72.305	72.019	0.286
Totals	97,310	97,850	-540	.004864**	.004851**	.000013**	214.669	215.261	-0.592
* SRO - ORGDP									
** Average									

Economics of Discontinuing Scrap Sampling

Substantial monetary savings are to be realized by eliminating the sampling and storage of current scrap materials accumulation. It is estimated that the sampling and analytical effort alone amounts to \$1,270 per month. An effort is being made to recover scrap materials on an as-generated basis. Segregation is made by point of origin to minimize isotopic dilution losses.

The principal solid scrap currently being processed through the continuous dissolver in K-1420 is alumina. At the present throughput rate, there are approximately 2 to 3 months supply of alumina available for maximum operation on this material before attaining a current status. Other materials can then be processed, possibly including off-area scrap.

Cascade Hidden Inventory Factors

All necessary cascade hidden inventory factors have been adjusted to reflect the most recent cascade equipment changes and decontamination experience. The use of these factors will become effective January 1, 1960, and will be used in calculating the quarterly cascade hidden inventory for the Oak Ridge Gaseous Diffusion Plant. Table G-3 presents a breakdown of these factors by types of equipment and plant location.

Material Releases

There were no material releases involving uranium at the ORGDP during the quarter other than those vented to the atmosphere during the operation of the K-1131 building. A total of 118,136 grams uranium and 834 grams uranium-235 were released. Table G-4 presents these releases by type of material processed.

Nickel Residues Received From International Nickel Company

During the three-month report period, 54,106 pounds of nickel residue were received from the International Nickel Company, making a total of 401,181 pounds received to date. During the quarter, 145,604 pounds of nickel residue were shipped to Oak Ridge Processing Company for smelting into ingots. A total of 163,549 pounds of nickel residue has been shipped to Oak Ridge Processing Company, leaving 237,632 pounds on inventory at the ORGDP.

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TABLE G-3
Cascade Hidden Inventory Factors

Section	Equip- ment Size	Converter Consumption		Cell Piping Consumption		Unit Piping Consumption		Pumps Consumption		Seal Consumption gu/seal
		Initial gu/conv	Long Term gu/conv/d	Initial gu/stage	Long Term gu/stage/d	Initial gu/unit	Long Term gu/unit/d	Initial gu/pump	Long Term gu/pump/d	
K-305	3	67.10	0.065195	2.98	0.00117	124.9	0.05589	0.9398	0.09401	12.9
K-304	3	67.10	0.065195	2.98	0.00138	123.1	0.05260	0.9398	0.09401	12.9
K-303	2	141.12	0.019272	4.83	0.00199	188.8	0.08219	1.1780	0.10460	12.9
K-302	2	141.12	0.019272	4.83	0.00202	187.0	0.08219	1.1780	0.10460	12.9
K-310	2	141.12	0.019272	4.83	0.00206	149.6	0.06575	1.1780	0.10460	12.9
K-311	3	67.10	0.065195	2.98	0.00155	127.4	0.05589	0.9398	0.09401	12.9
K-301 *	1	144.08	0.056404	5.80	0.00248	206.9	0.09205	1.1780	0.10460	12.9
K-309	1	144.08	0.056404	5.80	0.00248	161.0	0.06904	1.1780	0.10460	12.9
K-402 *	2	141.12	0.019272	4.83	0.00206	203.3	0.08877	1.1780	0.10460	12.9
K-502	0	657.86	0.290346	6.65	0.00500	431.8	0.19068	26.21	0.81100	12.9
K-602 1-5	00	1066.16	0.018578	16.64	0.00428	703.6	0.30904	20.42	0.76200	12.9
K-602 6	00	1066.16	0.018578	16.64	0.00428	800.2	2.08110	20.42	0.76200	12.9
K-902 1-7	000	1232.22	1.663733	15.32	0.01131	1050.2	0.46027	29.46	1.62200	12.9
K-902 8	000	1232.22	1.663733	15.32	0.01131	1140.4	3.89589	29.46	1.62200	12.9

* Badger Cluster

2.30 0.00098

K-306 Seals - 1,140 seals at 7.2 gu/seal

TABLE G-4
Material Releases, Grams

Month	Depleted Reactor Tails		Normal		Enriched Reactor Tails	
	U	U-235	U	U-235	U	U-235
October, 1959	-	-	33,180	236	-	-
November, 1959	22,825	148	5,788	41	9,594	82
December, 1959	25,705	167	13,922	99	7,122	61
Total	48,530	315	52,890	376	16,716	143

Radiation Alarm

The new portable radiation alarm for use by the Materials Handling Department was tested and operation was satisfactory on 115 volt commercial power and on power from a portable gasoline powered electric generator. Faulty operation was first obtained when the alarm was powered by a power converter operated by a truck electrical system. This fault was corrected, however, when a constant voltage transformer was installed and internal adjustments in the alarm were made.

K-633-2 Test Loop

The K-633-2 test loop is complete and in operation. The total calculated volume of the system from the compressor flanges but excluding the compressor is 3,049.67 ft.³

Toxicological Information

A survey conducted at the request of the AEC revealed no new chemically or radiologically toxic material generated or introduced to the ORGDP during 1959.

CORROSION AND CONSUMPTION

QUANTITATIVE DETERMINATION OF FLUORIDE FORMED ON BARRIER

Excellent agreement was found between the amounts of fluoride formed on SD barrier as determined by the weight gain and pyrohydrolysis methods although sample to sample differences indicate a considerable variation in corrosion rates. Samples used in this determination were five 6-inch barrier tubes chosen at random from a group of fifty such tubes that were exposed to a mixture of

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being concentrated at the boundaries of the enlarged gains during the entire exposure of the corrosive gas. Although the attack of nickel by uranium hexafluoride at 1800°F. is controlled initially by the formation of a protective nickel fluoride film, extended exposure at this temperature eventually results in a deterioration of the film which is followed by a massive deposition of reduced uranium fluorides. Due to this break down in corrosion resistance, the usefulness of nickel in uranium hexafluoride systems is probably limited to temperatures below 1500°F.

ACCOUNTING EVALUATION STUDIES

CUMULATIVE PLANT ACCOUNTING EFFICIENCY

Estimated quantities of material representing the hidden inventory are shown in table G-6 by categories. The plant accounting efficiency is 99.86% for uranium and 99.81% for uranium-235. This has been determined by dividing the sum of the hidden inventory, the plant quarterly ending inventory and the shipments by the total plant receipts, and multiplying by 100. Cumulative plant uranium and uranium-235 book-physical inventory differences are shown in figure G-1.

TABLE G-6
Accounting Memorandum

Location of Deposit or Source of B.P.I.D.	Uranium Kilograms	Uranium-235 Kilograms
Cascade:		
Inactive Consumption	4,716.2	853.2
Active Chemisorption	669.2	72.5
Physical Adsorption	1,425.6	112.1
Inventory Understatement	1,804.7	587.4
K-311 and K-312 Sections	17.9	5.7
Inactive Converters	46.6	1.8
K-1405 Holding Pond	120.0	2.5
Uncredited Materials Sent to Hot Salvage on Contaminated Drums	225.0	1.5
Poplar Creek Bed Contamination	4,784.0	37.3
Ground Near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
ORGDP - Paducah Interplant Cylinder "Heels"	--	179.2
Dilution before July, 1955	--	--
Total	20,778.2	1,902.2

BOOK-PHYSICAL INVENTORY DIFFERENCE BALANCE AREA LIMITS OF ERROR

The deficiency experience for four balance areas together with the calculated limits of measurement uncertainty are presented in control chart form in figure G-2. A discussion of the book-physical inventory differences relative to these calculated limits of measurement uncertainty is included. It should be noted that the limits of error are reported for September, October, and November. This adjustment reflects a transition in reporting book-physical inventory difference limits of error one month out of phase with the current quarter in order to meet reporting schedules.

Cascade Balance Area

During the quarter significant cascade operations affecting the material balance of this area were special withdrawal activity, change in target assays of top product and side product, and change in inventory time for the December 1 inventory. Special withdrawals during the quarter amounted to 863 kilograms uranium-235. On October 27 the target assay of product was increased by 0.3%; and on October 22 the target assay of side production was decreased by 7.8%. When assessed with respect to the noted significant operating conditions and the calculated limits of measurement uncertainty, the reported book-physical inventory differences are considered satisfactory.

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**SANITIZED VERSION OF EXTRACT FROM OAK RIDGE GASEOUS DIFFUSION
PLANT QUARTERLY REPORT FOURTH QUARTER FISCAL YEAR 1976
(APRIL 1 THRU JUNE 30, 1976)**

(EXTRACTED FROM CRD DOCUMENT # K-1920)

**Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement**

December 21, 1995

**Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
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Oak Ridge K-25 Site

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K-1920

OAK RIDGE GASEOUS DIFFUSION PLANT

QUARTERLY REPORT (U)

FOURTH QUARTER FISCAL YEAR 1976
April 1, 1976 through June 30, 1976

UNION
CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
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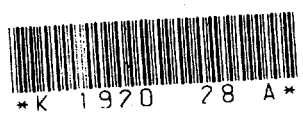
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OAK RIDGE GASEOUS DIFFUSION PLANT QUARTERLY REPORT (U)

FOURTH QUARTER FISCAL YEAR 1976
April 1, 1976 through June 30, 1976

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Planning Department
Title

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Cascade Operating Changes

Cascade operating changes during the fourth quarter are summarized below.

<u>April</u>	<u>Contract Power (mw)</u>	<u>Assay</u>		<u>Number of Operating Cells</u>				<u>Remarks</u>
		<u>Top</u>	<u>Side</u>	<u>K-29</u>	<u>K-31E</u>	<u>K-33</u>	<u>K-31S</u>	
1	1,530	3.20	2.90	17	33	78	23	Continued from March
2-16	1,530	3.20	2.73	17	33	78	23	Side PW assay decreased
17-20	1,530	3.20	2.66	17	33	78	23	Side PW assay decreased
21-25	1,530	3.20	2.69	17	33	78	23	Side PW assay increased
26-30	1,530	3.01	2.60	17	33	78	23	Top and Side PW assay decreased
<u>May</u>								
1-6	1,530	3.01	2.60	17	33	78	23	Continued from previous month.
7	1,530	3.01	2.78	17	33	78	23	Side PW assay increased
8-11	1,530	3.10	2.78	17	33	78	23	Top PW assay increased
12-22	1,530	3.10	2.79	17	33	78	23	Side PW assay increased
23-31	1,530	3.10	2.36	17	33	78	23	Side PW assay decreased
<u>June</u>								
1-12	1,530	3.10	2.36	17	33	78	23	Continued from previous month
13-14	1,395	3.10	2.36	17	33	77	23	135-Mw power reduction
15-29	1,395	3.10	2.60	17	33	77	23	Side PW assay increase
30	1,395	3.15	2.60	17	33	77	23	Top PW assay increase

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Table C-3 summarizes the fourth quarter stockpile inventories by various assay ranges. Power Utilization Index (PUI) experience is given in Table C-4. Table C-5 indicates the average unit cost of separative work production during the third and fourth quarters. Figure C-2 presents the cascade gradient for the third and fourth quarters.

Table C-3

STOCKPILE INVENTORY
(Kilograms Uranium)

	<u>2.0- 2.3%</u>	<u>2.4- 2.5%</u>	<u>2.6- 3.0%</u>	<u>3.1- 3.3%</u>	<u>3.4- 3.9%</u>	<u>4.0%</u>
Beginning Inventory April 1, 1976	20,958	547,630	281,291	1,904,014	53,620	9,034
Ending Inventory June 30, 1976	19,435	541,462	320,828	1,775,638	53,620	9,034

Table C-4

POWER UTILIZATION INDEX EXPERIENCE

<u>FY 1976 Third Quarter</u>	<u>SW/Day</u>	<u>Process Power (mw)</u>	<u>PUI</u>	<u>FY 1976 Fourth Quarter</u>	<u>SW/Day</u>	<u>Process Power (mw)</u>	<u>PUI</u>
January	10,664	1,258	8.47	April	11,475	1,382	8.33
February	11,140	1,274	8.75	May	11,486	1,394	8.26
March	11,373	1,352	8.41	June	11,030	1,293	8.53
Average	11,057	1,295	8.54		11,332	1,356	8.37

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Table C-7

URANIUM-235 INPUT
(Kilograms U-235)

Third Quarter FY 1976				Fourth Quarter FY 1976			
<u>Month</u>	<u>Total</u>	<u>Daily Rate</u>	<u>% Change</u>	<u>Month</u>	<u>Total</u>	<u>Daily Rate</u>	<u>% Change</u>
January	5,163	166.5	5.6	April	4,903	163.4	-0.7
February	4,463	153.9	-8.2	May	5,194	167.5	2.5
March	5,098	164.5	6.4	June	4,710	157.0	-6.3
Total	14,724				14,807		
Average		161.8	5.4	Average		162.7	0.6

Table C-8

CASCADE INVENTORY CHANGE

<u>Month</u>	Third Quarter FY 1976			
	Uranium-235		Enriched U-235	
	<u>Ending Inventory</u>	<u>Δ</u>	<u>Ending Inventory</u>	<u>Δ</u>
January	1,866	233.54	398	101.77
February	1,840	-25.62	406	7.23
March	1,967	127.14	415	9.27
Total		335.06		118.27

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Table C-8 -- CASCADE INVENTORY CHANGE (continued)

Month	Fourth Quarter FY 1976			
	Uranium-235		Enriched U-235	
	Ending Inventory	Δ	Ending Inventory	Δ
April	1,865	-102.51	346	-69.03
June	1,863	-1.88	323	-23.07
July	1,745	-117.55	345	-21.82
Total		-221.94		-113.92

EFFICIENCIES AND PURGE RATES

Cascade Efficiency

Based on the separative work concept, the April, May, and June cascade efficiencies were 99.65%, 99.70%, and 99.50%, respectively, for a quarterly average of 99.62%.

On-Stream Efficiency

The cascade on-stream efficiency during the fourth quarter FY 1976 averaged 99.12%. Excluding time attributable to the plant test program and power control, the efficiency averaged 99.12%.

The quarterly efficiency for each of the cascade buildings averaged 98.91% for K-33, 99.13% for K-31, and 100% for K-29.

PURGE CASCADE

The average normal purge rate at K-311-1 during the fourth quarter FY 1976 was 15,255 scf per day. The highest monthly average during the quarter was in May when 15,823 scf per day was purged. The April and June rates were 14,493 and 15,450 scf per day, respectively.

New Purge Cascade - K-402-9

The new purge cascade was placed on-stream on April 20 after several weeks of operational testing and debugging. K-311-1 purge unit was isolated and placed in standby. The new unit purged lites satisfactorily.

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The Freon degrader was placed in operation simultaneously with the purge cascade. The UF_6 , F_2 , and N_2 flows were insufficient to handle the normal upflow of Freon in the cascade and the degrader breakdown gases would not purge off. Following tests with no positive results the unit was taken off-stream on May 2 for evaluation and K-311-1 was placed back on-stream.

A series of tests were made during May and June to define problem areas in the new purge cascade. Results of these tests indicate a flow restriction in the B stream collector. Barrier plugging tests were made to determine if a temporary operating condition with a controlled plugged barrier would permit the new purge cascade to operate while a permanent solution was accomplished. Results of this test were negative.

A spare converter was installed in the K-1303 test facility for testing; various alterations to the B stream collector were made to determine the most feasible approach to correct the problem.

Results from the K-1303 test facility regarding the B stream collector indicate that an extension of approximately five inches is required to increase the cross-sectional area of the collector, thus reducing the pressure losses associated with the collector. The collector outlet should also be flared to reduce pressure losses. One high speed converter was modified in K-1401 and after both *slope* tests and aerodynamic tests the converter will be installed in K-402.9.4.3. If favorable test results and authorization from ERDA are obtained, 23 additional converters will be modified.

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K-1203 Wastewater Treatment

On June 11 Union Carbide assumed beneficial occupancy of the new treatment system at which time diversion of flow to the new facility took place. Seeding of the process reactor commenced on June 14 and was completed on June 17. Seed material was obtained from the City of Oak Ridge Wastewater Treatment Plant.

Although the biochemical action of the treatment plant is performing satisfactorily, a hydraulic problem exists between the aeration tank and the sludge tank. Representatives from Lyco-ZF, Inc., the tank manufacturer, have determined that the eight-inch pipe connecting the two tanks is of improper size and that to correct the hydraulic problem, the eight-inch pipe will have to be replaced with a 14-inch pipe. This work will be performed by Lyco and is scheduled to start on July 12.

CHEMICAL OPERATIONS

A summary of Chemical Operations activities during the fourth quarter follows. A statistical summary of K-1420 Operations is given in Table C-15.

Disposal of Old Cylinders

The disposal of 533 UF₆ cylinders from the K-1025 storage buildings was completed during May.

Bundle Service

Forty-three converter bundles were destructed during the fourth quarter. Modifications made to the system during June included the installation of several extra support rollers under the drying belt, removal of a section of the drying belt to allow better adjustment of the belt tension, and installation of rubber skirts around the bottom edge of the scrap hopper. These modifications have greatly reduced the spillage of barrier off the drying belt in the tunnel.

Neutralization Facility, K-1407 A&B

Upgrading work associated with the Neutralization Pit (K-1407A) was completed in June.

A study is under way to investigate potential problems associated with the facility operation within future guidelines, and to formulate operating procedures under these constraints. Emphasis was placed on identification of causes of day to day pH fluctuations as noted at the K-1407B holding pond weir. The following conclusions were drawn from this work:

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Table C-15
K-1420 OPERATIONS SUMMARY

	April	May	June	Fourth Quarter FY 1976 Total	Third Quarter FY 1976 Total
K-1420 Production and Metal Finishing:					
Ash Shipped, kilograms U	45	98	0	143	0
Incinerated Ash, kilograms	272	249	123	644	370
Starting Materials, lbs.	106	93,750	14,400	108,256	37,588
Oxide from Calciners, kilograms	172	374	116	662	633
Metal Preparation, Sq. Ft.	445	1,219	752	2,416	4,028
Repackaged Enr. Oxide Shipped, Kg.	0	0	0	0	464
Electroless Ni Plating, Mil Ft	1,711	4,774	3,217	9,702	6,300
Electro Nickel Plating (Watts), Mil Ft	3,870	2,430	3,705	10,005	21,066
Metal Anodized, Ft	137	14	140	291	142
Metal Alodined, Ft	7	70	0	77	12
Black Oxide, Ft	80	221	140	441	269
Aluminum Nitrate, Gal.	300	900	0	1,200	3,900
K-1420 Recovery Operations:					
Uranium Solutions					
ORGDP (Liters)	1,272	1,066	633	2,971	2,625
Leached Alumina, Lbs.	1,925	4,667	2,614	9,206	7,264
Mercury, Lbs.	0	0	844	844	108
Decontamination and Services:					
Valves, Ea. (42")	4	0	5	9	63
Compressors:	0	0	0	0	24
00	4	2	7	13	0
000	7	4	3	14	0
Test Loop	0	0	0	0	14
Converters: Size 00	0	10	1	11	0
000	6	2	12	20	22
Cylinders 2.5 Ton	11	12	27	50	101
Cylinders 10-ton	0	0	1	1	2
Cylinders MD	7	23	0	30	0
Classified Small Parts	64	80	70	214	811
Decontamination Requests	40	58	44	142	120
Miscellaneous					
Replenish Alumina Traps	65	28	72	165	146
To Holding Pond, Kgs. U	5	35	24	64	49
Contaminated Material Incinerated, Cu. Ft.	171	119	132	422	543
Contaminated Oil Disposal Gal.	346	178	696	1,220	265

1. Influent flow quickly through the pond to the weir. Travel time is approximately 2-1/2 hours from the southeast corner and 1-1/2 hours from the pit discharge point.
2. An effort has been made not to dump out-of-range solutions. The pH monitoring stations show influents within the required range of pH 6 to pH 9.
3. The pH instrumentation must be upgraded. Present instruments are not reliable and their accuracy is no better than ± 1 pH unit.
4. In spite of controls, instrumentation, etc., an accidental dump to the pond will eventually occur. To avoid an offense to the environment, a gate should be placed at the weir, enabling quick closure of effluents.
5. Under normal circumstances, approximately 3 hours after an addition to the pond of solution differing in pH from that of the pond itself has occurred, the pond will stabilize and pH variation within the pond is negligible.

Leaching Columns, K-1420

Replacement of the 5-inch diameter leaching columns by new 8-inch columns was completed in early April. The new equipment has worked satisfactorily and no further work is anticipated.

Uranium Scrap Treatment

An economic analysis was performed on the uranium scrap treatment facility located in K-1420 to determine if uranium-bearing materials should continue to be treated (recovered). The analysis indicated that recovery of most scrap generated at the ORGDP is uneconomical; that is, treatment costs exceed the value of the recovered UF_6 . Environmental considerations allow for solid scrap to be buried, but dictate that solution scrap continue to be processed.

It is recommended that scrap solids continue to be processed, since the cost of discarding solid scrap and treating solutions alone proved to be more expensive than the cost of the present method of total treatment of all scrap.

BARRIER OPERATIONS

Production

Table C-16, which summarizes tube production, percent yield, and tube shipments during the fourth quarter, shows an increase in tube production each month; a summary of barrier manufacturing activities follows.

Table C-18

ACCOUNTING MEMORANDUM

<u>Location of Deposit or Source or Hidden Inventory</u>	<u>Kilograms</u>	
	<u>Uranium</u>	<u>Uranium-235</u>
STATION FZA		
K-1405 Holding Pond	254.8	5.3
Uncredited Contamination on Drums	225.0	1.5
Poplar Creek Bed Contamination	6,594.0	53.1
Ground near Feed Plant	191.0	1.3
Losses by Vent to Atmosphere	6,778.0	47.7
Dilution before July, 1955	-	179.2
Total Station FZA	14,042.8	288.1
STATION BWA		
Cascade:		
Inactive Consumption	17,568.0	1,390.9
Active Chemisorption	665.7	54.8
Physical Absorption	625.3	7.0
Inactive Converters	92.8	2.7
Total Station BWA	18,951.8	1,455.4

Nuclear Materials Handling Operation

Responsibility of the material handling functions involves the weighing, sampling, and storage of major material quantities received at or shipped from the plant site, as well as internal material transfers. The material flows include both ERDA and customer nuclear materials. Table C-19 is a summary of shipments made during the fourth quarter. Material on hand awaiting shipment is shown in Table C-20.

ENVIRONMENTAL MANAGEMENT

Administrative Reporting Limits For Radioactive Discharges

In order to provide more effective control of ORGDP effluents emitting radioactive wastes, a system has been established, in accordance with ERDA Manual Chapter 0511, Radioactive Waste Management, to allow for nonroutine reporting of abnormal releases. The system consists of the establishment of administrative limits for each radionuclide discharged from each effluent and the subsequent review of sampling data related to these limits on a routine basis. In the event any limit is found to be exceeded, it will be reported to the ORO Environmental Protection Branch, and steps will be taken to determine the cause of the increase. Should the increased level be determined to be excessive, actions will be immediately initiated to reduce the discharge to an acceptable level.

Steam Plant

Procurement of the electrostatic precipitators is still on schedule, and it appears that the installation deadline of October 1, 1977, can still be met.

On June 3, 1976, representatives from the Environmental Protection Agency and the State of Tennessee Department of Air Pollution Control visited the ORGDP. The primary purpose of this visit was to fulfill their obligations which are outlined in the State Implementation Plan (SIP). This plan requires that they visit at least three pollution sources within their region each year.

K-1515 Sampling Station

Modifications to correct infiltration problems were completed, the flow measuring device was installed at the weir, and the station is presently operable.

Containment of Oil and Hazardous Materials

The portion of this project requiring modifications at the HF tank farm has been submitted to Rust, but Carbide has not received a schedule specifying when the work will begin. The remainder of the project will be completed by another contractor. This contractor should be selected and construction initiated during the next six weeks.

K-1203 Sewage Treatment Plant

Union Carbide received beneficial occupancy of the new sewage plant on June 11, 1976. A rainstorm which occurred on June 18 resulted in excessive flows within the sewage plant, thus upsetting the stability of the system. As a result of this incident, an extensive survey is underway to identify and eliminate sources of storm drain run-off and ground water

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infiltration which are entering the system. In addition to the above problems, once-through cooling water is also recognized as a potential contributor of routine excess flows. A detailed survey is being conducted to locate air conditioning units, refrigeration units, and other units requiring once-through cooling water and to re-route drains to the storm drain system when necessary to eliminate excessive flows.

Disposal of Equipment Containing Mercury

A meeting was held with representatives of the ERDA Environmental Protection Branch to discuss disposal of high intensity mercury vapor lamps and other mercury containing equipment. Due to the relatively small quantities of mercury contained in light bulbs, it was decided that they present minimal potential for harming the environment. The mercury vapor bulbs and fluorescent lamps will still be deposited in the sanitary landfill. Other items which contain larger quantities and exhibit greater potential harm to the environment are mercury switches, thermometers, gages, thermostats, etc. These items will be collected in appropriately marked drums and an alternate procedure selected for their disposal. This information was transmitted to appropriate K-25 personnel in Maintenance Bulletin No. 79 on June 17, 1976.

Major Equipment Purchases

During the report period, a booster pump was procured which will be used in association with the oil skimming equipment. The skimming pump does not provide sufficient head to pump oil into a truck for disposal; the booster pump will provide the head needed. This pump will be stored in the trailer which contains the other oil skimming equipment.

Two flow-proportional refrigerated composite samplers for the new sewage plant were procured. These samplers are needed to meet EPA requirements and will be installed as soon as work being performed by the construction contractor is complete.

Four of eight new air samplers have been received and are presently in storage. The samplers will be installed as soon as the remaining four are received. These samplers will be spaced incrementally between existing stations and will operate on a continuous basis, thus supplying more reliable data collection during times when accidental releases occur.

Fish Sampling

The Environmental Sciences Division of ORNL with support from ORGDP's Environmental Management Group began an extensive fish sampling program in May, 1976. Previous analyses of fish from the ORGDP environs indicated abnormally high concentrations of mercury. Several species of fish at varying stages of development are being sampled from Poplar Creek and the Clinch River. The samples are being prepared and analyzed at Y-12.

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Quarterly EPA Report

The EPA liquid effluent report for the first quarter of CY-1976 was submitted to ERDA on April 27. The report covered the effluent monitoring data from January 1, 1976 through March 31, 1976. During this period, abnormally high pH values continued to be observed at Discharge Point 007 (K-901-A holding pond). Low chlorine residual values were again recorded at Discharge Points 005 and 008 (K-1203 sewage treatment facility and K-710-A sewage treatment facility, respectively). High pH values were recorded at Discharge Point 006 (K-1007-B holding pond). At Discharge Point 002 (K-1410 Nickel Plating Facility) pH values exceeded the 6.0-9.0 range. High chromium values were recorded at Discharge Point 007 (K-901-A holding pond).

NPDES Noncompliance Situations - April 1 - June 30, 1976

The pH at K-1007-B holding pond continued to exceed 9.0 on an intermittent basis. Further investigation of the problem indicated that the high pH values were probably a result of biological activity related to the presence of algae and/or the rinsing of concrete trucks in and around the pond by outside concrete suppliers. With a decline in the growth of algae and the abatement of the truck rinsing operation, the pH correspondingly declined. At the present time, pH violations have been reduced to one or two per week.

On June 1, 1976 a composite sample taken at K-1007-B holding pond revealed a chromium level of 0.10 mg/l, which exceeded the NPDES permit limit of 0.05 mg/l. Air filters in the K-29 building were washed with fire water containing chromium, with the resulting effluent being discharged to the K-1007-B holding pond. This operation had been postponed well beyond the scheduled date while awaiting completion of a nonchromated fire water system. However, when slippage of this project became evident, it was apparent that further postponement of the filter cleaning could result in extensive problems with process equipment. Therefore, in view of the negligible environmental impact of such a small, short-term release, the decision was made, with the concurrence of the ORGDP Environmental Management Group, to clean the filters with a minimum quantity of fire water. The aforementioned project to provide for nonchromated fire water should be completed by January 1, 1977, so that future uses of this water system, including filter washing, should not present an environmental problem.

As of January 1, 1976, new limits went into effect for two discharge points, resulting in further violations due to incomplete pollution abatement projects. At the K-901-A holding pond the chromium limit was exceeded. The Recycle/Resoften Blowdown Project (GPP 1973) will hopefully alleviate this problem; it is scheduled for completion in July, 1976. At the K-1410 nickel plating facility pH values have exceeded the NPDES permit range. An In-line Equalization and Neutralization Basin (GPP 1974) is scheduled for completion by January 1, 1977. This should eliminate further pH violations.

ORGDP effluent data for March, April, and May, 1976, are presented in Tables E-7 through E-14.

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Table E-7
EMISSION DATA AT ORGDP EFFLUENTS
Location: K-1131 STEAM CONDENSATE DISCHARGE

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR.		APR. AVERAGE	MAY MAX.	PROPOSED EFFLUENT STANDARD	
	MIN.	MAX.			Daily Min.	Daily Avg. Daily Max.
Flow (MGD)	(2)		0.0036	(2)	0.005	0.008 ⁽¹⁾
Chemical Oxygen Demand, mg/l	(2)		5	(2)		
Conductivity, μ mhos	(2)		190	(2)		
pH	(2)		7.9	(2)	6.0	9.0 ⁽¹⁾
Temperature, (°F)	(2)		99°	(2)		

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

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Table E-8
EMISSION DATA AT ORGDP EFFLUENTS
Location: K-1700 HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR.		APR.		MAY		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MIN.	AVERAGE	MAX.	Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.968	1.523			2.701			
Aluminum, mg/l	0.20	0.23			0.28			1.0 mg/l ⁽¹⁾
Chemical Oxygen Demand, mg/l	3	11			27			
Chromium, mg/l	0.01	0.11			0.25			0.08 mg/l ⁽¹⁾
Dissolved Solids, mg/l	227	337			439			
Fluoride, mg/l	0.94	1.2			1.7			
Nitrate	27.4	45.7			70.8			90 mg/l ⁽¹⁾
Oil and Grease, mg/l	<1	<1			2		10 mg/l	15 mg/l ⁽²⁾
pH	5.5	7.2			9.6			9.0 ⁽¹⁾
Suspended Solids, mg/l	5	8			10		30 mg/l	50 mg/l ⁽¹⁾
Temperature (°F)	52	63			70			
Turbidity, JTU	1	6			42			

(1) NPDES Discharge Permit No. TN0002950 effective January 1, 1977.

(2) NPDES Discharge Permit No. TN0002950 effective now.

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Table E-9

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-710 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MIN.	MAR. APR. AVERAGE	MAY MAX.	PROPOSED EFFLUENT STANDARD	
				Monthly Avg.	Weekly Avg.
Flow (MGD)	0.012	0.019	0.032		
Biochemical Oxygen Demand, mg/l	1	<3	25	30	45 (1)
Suspended Solids, mg/l	<1	<5	9	30	45 (1)
Fecal Coliform Bacteria (No. per 100 milliliter)	0	0	0	200	400 (1)
pH	6.5	7.3	8.3	The pH shall not be less than 6.0 nor greater than 9.0 (1). The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l. (1)	
Chlorine Residual, mg/l	0.0	1.3	>2		
Settleable Solids (ml/l)	<0.1	<0.1	<0.1		1.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

Table E-10

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1515 SANITARY WATER PLANT

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR.		APR.		MAY		PROPOSED EFFLUENT STANDARD		
	MIN.	AVERAGE	MAX.	MIN.	AVERAGE	MAX.	Daily Min.	Daily Avg.	Daily Max.
Flow (MGD)	0.065	0.087	0.108						
Suspended Solids, mg/l	<5	10	17				30 mg/l	50 mg/l	(1)
Aluminum, mg/l	0.22	1.29	3.0					250 mg/l	(1)
Sulfate, mg/l	13	15	17					1400 mg/l	(1)
Chemical Oxygen Demand, mg/l	3	7	14						
pH	7.0	7.2	7.3						

(1) NPDES Discharge Permit No. TN0002950 effective July 1, 1976

Table E-11

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-901-A HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. MIN.	APR. AVERAGE	MAY MAX.	PROPOSED EFFLUENT STANDARD	
				Daily Min.	Daily Avg. Daily Max.
Flow (MGD)	0.914	>2.397	>13.392		
Chemical Oxygen Demand, mg/l	13	16	19		0.05 mg/l (1)
Chromium	3.7	4.5	6.2		
Dissolved Oxygen, mg/l	12	14	17		
Fluoride	0.30	0.33	0.35	1.0 mg/l	1.5 mg/l (1)
Oil and Grease, mg/l (2)		2.9		10 mg/l	15 mg/l (1)
Suspended Solids, mg/l	6	15	27	30 mg/l	50 mg/l (1)
Turbidity, JTU	1	5	11		
pH	7.6	9.5	10.7	6.0	9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Only one quarterly sample taken.

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Table E-12
EMISSION DATA AT ORGDP EFFLUENTS
Location: K-1007-B HOLDING POND

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR.		APR.		MAY		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE	MAX.		MAX.		Daily Min.	Daily Avg. Daily Max.
Flow (MGD)	1.025	>1.745	>5.707					
Suspended Solids, mg/l	5	24	78				30 mg/l	45 mg/l (1)
Chemical Oxygen Demand, mg/l	3	10	16				20 mg/l	25 mg/l (1)
Chromium	0.02	0.03	0.04					0.05 mg/l (1)
Dissolved Oxygen	4.0	9.2	14.7				5.0 mg/l (1)	
Fluoride	0.37	0.58	0.76				1.0 mg/l	1.5 mg/l (1)
Oil and Grease, mg/l	<1	<1	<1				10 mg/l	15 mg/l (1)
pH	6.0	8.4	10.2					9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

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Table E-13

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1203 SANITARY TREATMENT FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MIN.	MAR. APR. MAY		PROPOSED EFFLUENT STANDARD	
		AVERAGE	MAX.	Monthly Avg.	Weekly Avg.
Flow (MGD)	0.317	0.638	1.738		
Biochemical Oxygen Demand, mg/l	2	16	45	15	20 ⁽¹⁾
Suspended Solids, mg/l	5	16	48	30	45 ⁽¹⁾
Chlorine Residual, mg/l	0	0.8	2.0	The chlorine residual shall not be less than 0.5 mg/l nor greater than 2.0 mg/l. ⁽²⁾	
pH	6.1	6.7	7.4	The pH shall not be less than 6.0 nor greater than 9.0. ⁽²⁾	
Fecal Coliform Bacteria (No. per 100 milliliter)	0	0	0	200	400 ⁽¹⁾
Settleable Solids, ml/l	<0.1	<0.3	2.0	The settleable solids shall not exceed 0.5 ml/l.	
Ammonia Nitrogen, mg/l	0.17	3.4	5.3	5	7 ⁽¹⁾

(1) NPDES Permit No. TN0002950 effective July 1, 1976.

(2) NPDES Permit No. TN0002950 effective now.

Table E-14

EMISSION DATA AT ORGDP EFFLUENTS

Location: K-1410 NICKEL PLATING FACILITY

EFFLUENT CHARACTERISTIC OR OPERATING PARAMETER	MAR. APR. MAY.		PROPOSED EFFLUENT STANDARD	
	MIN.	AVERAGE MAX.	Daily Min. Daily Avg. Daily Max.	
Flow (MGD)		0.0072		
Cyanide, mg/l		0.005	< 0.0005 mg/l	0.011 (2)
Oil and Grease, mg/l	<1	9	24	10 mg/l 15 (1) mg/l
Nickel, mg/l	0.005	0.23	0.55	
pH	2.4	8.5	11.8	6.0 9.0 (1)

(1) NPDES Discharge Permit No. TN0002950 effective now.

(2) Background concentration determined from Clinch River Samples.

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Table F-6

THE REACTION OF SILICON WITH URANIUM HEXAFLUORIDE,
FLUORINE, OR CHLORINE TRIFLUORIDE

Reaction Gas			Reaction Rate, mg silicon/cm ² /day			
Type	Percent(a)	Partial Pressure, psia	200°F	300°F	400°F	450°F
Uranium Hexafluoride	100	1.00	1	6	90	200
Fluorine	5	0.20	8	10	40	80
Fluorine	20	0.20	20	40	90	150
Fluorine	5	0.60	15	30	80	150
Chlorine Trifluoride	5	0.01	25	30	20	30
Chlorine Trifluoride	5	0.05	70	80	60	60
Chlorine Trifluoride	5	0.20	250	200	180	220
Chlorine Trifluoride	20	0.20	400	500	(b)	(b)
Chlorine Trifluoride	5	0.60	750	(b)	450	590
Chlorine Trifluoride	20	0.60	1,360	1,030	(b)	(b)

(a) The balance of the gas is nitrogen.

(b) Not obtained.

Transuranic Elements and Technetium in the ORGDP Cascade

[Keywords: Barrier Contaminants--Transuranics; Barrier Contaminants;
Barrier Analyses; Plutonium; Neptunium; Technetium]

In order to obtain information as to the level of transuranic contamination and its distribution after decontamination of equipment, barrier samples have been obtained from three barrier bundles before and after decontamination of the barrier material at K-1420. Small, though significantly detectable, quantities of plutonium and neptunium have been found on the barrier. Larger amounts of technetium have also been found. The quantities of the transuranics are only slightly above the detection limits; therefore, the precision of the analyses is relatively poor ($\pm 50\%$ of the value).

A comparison of data from Cells K-902-5.1 and K-902-8.2 is shown in Table F-7. Cell K-902-8.2 was not given a ClF_3 treatment before final removal from the cascade, while Cell K-902-5.1 was treated. The pre- and post-decontamination data revealed a statistically significant reduction in

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barrier concentration for the neptunium, but one cannot deduce with certainty the fate of the plutonium in this operation. At these very low levels of activity, there is little likelihood of detecting significant quantities of these elements in the decontamination solutions. Other barrier will be sampled in the future to attempt to arrive at an ORGDP cascade inventory of these transuranic elements.

The neptunium and plutonium are primarily associated with the FeF_3 dust

The maximum permissible body burden* for these elements is 0.06 microcurie for neptunium and 0.04 microcurie for plutonium. At the levels of activity encountered with the K-902-8.2 barrier, it would be necessary to ingest about 20 g of the FeF_3 dust into the lungs to obtain one permissible body burden of these transuranics. Therefore, normal health precautions for working in dusty areas would preclude any personnel from ingesting harmful quantities of these materials. In addition, because of the relatively greater quantity of uranium in this dust, i.e., $[\text{U}]/[\text{Np}] \approx 10^5$, the maximum permissible level for uranium in the body would be reached and detected by the routine monitoring program long before the maximum permissible levels for transuranics could be reached.

SPECIAL STUDIES

K-1037 HOOD EXHAUST SAMPLING

[Keywords: Bag Filters; Particulate Matter; Hood Exhaust]

A program is under way to evaluate the efficiency of the bag filters used in Building K-1037.

The program is being performed for the plant Environmental Engineering Section of the Engineering Division. Sampling devices, consisting of a filter holder backed up by a liquid bubbler, are installed in the inlet and outlet of the bag filters. The particulate matter from both the filters and the bubblers is analyzed qualitatively and quantitatively. The particle size distribution is also being determined for each sample.

*"Maximum Permissible Body Burden and Maximum Permissible Concentration of Radionuclides in Air and in Water for Occupational Exposure," *National Bureau of Standards Handbook 69*, U.S. Department of Commerce, June 5, 1959.

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FACILITY II STACK SAMPLING

[Keywords: Stack Sampling]

An intensified filter sampling program was carried out on the K-1233 stack in Facility II.

Analysis of the collected samples was used to establish emission levels and to help detect operational problems. Daily samples were collected over a period of 2 weeks and sampling has continued on a once-per-week basis.

ANALYSIS OF CAUSTIC SOLUTIONS USED IN PURGE CASCADE FLUORIDE SCRUBBER

[Keywords: Purge Cascade; Fluoride Scrubbers]

Chemical analyses have been performed on solutions similar to those generated in the scrubber system which will service the new purge cascade. This scrubber employs a caustic (KOH) solution to remove contaminants including chlorides and fluorides from gases which are normally exhausted to the atmosphere during purging. Halide ion reaction with the caustic forms a variety of strongly oxidizing ions which are under study.

Solutions for use in this investigation have been generated in two ways. The gases being emitted from the K-311-1 purge have been collected in a caustic solution; and known quantities of chloride- and fluoride-containing gases have been reacted with caustic solution on a laboratory scale by Gaseous Diffusion Development Division personnel. Solutions generated by both techniques have been analyzed for caustic, fluoride, chloride, chlorates, perchlorates, uranium, and oxidizing number.

Similar analyses will be performed to monitor the plant scrubber operation and to study the regeneration cycle for the caustic solution. Substitution of sodium hydroxide for the presently used potassium hydroxide will be the basis for further laboratory studies by Development personnel.

PURIFICATION OF URANIUM HEXAFLUORIDE

[Keywords: Uranium Hexafluoride--Purification; Refrigerant-114--Removal]

A series of laboratory bench-scale experiments was conducted to determine how well R-114 can be removed from UF_6 by *burping*.

Synthetic mixtures of 10 mole % R-114 in pure UF_6 were prepared in 2-S cylinders. After the contents of the cylinders were liquefied and homogenized, the cylinders were placed in water baths controlled at 50, 38, 22, and 0°C and attached to vacuum manifolds equipped with cold traps. When the pressure in the cylinders had remained constant for 15 min, they were *burped* by pumping on them for 3 min. The *burping* was repeated until the pressure in each cylinder was that of pure UF_6 at the respective temperature.

~~SECRET~~

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. S. G. Thornton (K-25 EMD)
4. DOE Public Reading Room